KAOS Construct Analysis using the UEML Approach Template

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KAOS Construct Analysis using the UEML Approach Template

(Technical report)

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Outline

KAOS : Achieve goal

Document type:	Working document
Domain/Task/Topic:	DEM / UEML / Approaches
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Authors:	Raimundas Matulevičius
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Achieve goals are goals requiring that some property eventually holds.
Achieve goals state that some target condition should hold in some (bounded) future state.

1. Preamble

Builds on

Goal

Built on by

Construct name

Achieve goal

Alternative construct names

goal, requiring that a property eventually holds

Related, but distinct construct names

goal with a pattern achieve

Related terms

Goal : a prescriptive assertion capturing some objective to be met by cooperation of agents from the agent model.
Maintain goal: a goal requiring that some property always holds.
Avoid goal: a goal requiring that some property never holds.
Cease goal: a goal requiring that some property eventually stops to hold.

Softgoal: goal that do not have a clear-cut criterion for their satisfaction.
Terminal goals: a goal which has no G-refinement.
Requirement: a goal assigned to an agent in the software to be.
Expectation (*assumption*): a goal assigned to an agent in the environment.

Comment: Can a goal with a pattern be softgoal, terminal goal (requirement and expectation)?

Language

KAOS, http://www2.info.ucl.ac.be/research/projects/AVL/ReqEng.html

Diagram type

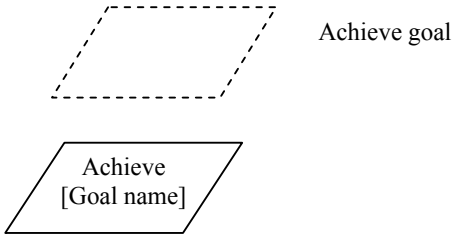
Goal model

2. Presentation

Builds on

Built on by

Icon, line style, text



User-definable attributes

Relations to other constructs

Diagram layout conventions

Other usage conventions

3. Representation

Builds on

Built on by

Instantiation level

Both type and instance level

Classes of things

1:1, "*goalOwner*" **played by** *StakeholderThing*.
Describing *goal owner* which holds the goal. Class *StakeholderThing* has a characteristic *holds goal*. *StakeholderThing* is subclass of the BWW-*HumanThing*.

1:1, "*concernedObject*" **played by** *AllThing*.
Describing *object* concerned by a *goal*.

Comment: *Achieve goal* has the same classes as a *goal*. It belongs to a *goal owner* and has the sub-properties. These classes are described here as they are used in property definition.

Properties (and relationships)

1:1, "*theAchieveGoal*" **played by** *ComplexTransformationLaw*.
Belongs to: 0:1 [1:1], *goalOwner*.
Trasformation law: a change is required between a state where the *concerned object* properties are false and one where they are true.
Representing the achieve goal which is held by a goal owner and requires that some concerned object properties eventually hold.

Comment: For more *achieve goal* properties (such as *concExplicitObjAttribute, concImplicitObjAttribute, attributeName, attributeDef, attributeFormalSpec, attributePriority,* and *attributeCategoty*), see *goal*.

Behaviour

Existence

Modality (permission, recommendation etc)

Intention of a goal owner;

4. Open Issues

Change List

KAOS : Agent

Document type:	Working document
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An *agent* is an active object (or "processor") which plays a specific role towards goal achievement by controlling specific object behaviours. The focus is thus on a specific role rather than a specific individual.

Agents are active objects, that is, they are capable of performing operations.

1. Preamble

Builds on

Object

Built on by

Environment agent
Software agent

Construct name

Agent

Alternative construct names

An active object
A processor

Related, but distinct construct names

- ***Environment agent*** : e.g., pre-existing software component, sensor, actuator, human, organizational unit, etc.
- ***Software agent*** : an agent in the system-to-be.

Related terms

Language

KAOS,
http://www2.info.ucl.ac.be/research/projects/AVL/ReqEng.html

Diagram type

Agent model

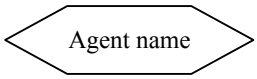
2. Presentation

Builds on

Built on by

Assignment,
Performance,
Controls,
Monitors

Icon, line style, text



Agent

User-definable attributes

[1:1] *Name*: String = "". A string allowing for unambiguous reference to corresponding instances at the application level.

[1:1] *Def*: FreeText = "". Free text used for precise, unambiguous definition of the corresponding instances at the application level.

Relations to other constructs

- Belongs 1:1 to agent model.
- 1:n [1:1] *responsibleAgent* : assignment. Agent has assignment to satisfy the goal.

Comment: Agents are objects. This means that agent could also not be a responsible agent as they could be defined in the object hierarchy.

- 0:n [1:n] *performs* : operation. Agent performs operation in order to satisfy operationalised by this operation goal, which is assigned to this agent.
- 0:n [0:n] *monitors* : object. Agent monitors ("reads") the attribute of the object.
- 0:n [0:n] *controls* : object. Agent controls ("writes") the attribute of the object.

Diagram layout conventions

Other usage conventions

3. Representation

Builds on

Built on by

Instantiation level

Both type and instance level

Classes of things

1:1 "*theAgent*" **played by** *ActiveComponentThing*.
Represents the agent.

1:1 "*monitoredControlledObject*" **played by** *ComponentThing*.
Represents *object,* controlled or monitored by an agent.

Properties (and relationships)

1:1 [1:1], "*attributeName*" **played by** *AnyRegularProperty*.
Belongs to: *theAgent*.
Represents *agent* attribute *name*.

1:1 [1:1], "*attributeDef*" **played by** *AnyRegularProperty*.
Belongs to: *theAgent*.
Represents *agent* attribute *def*.

1:n [1:n], "*monitoredImplicitObjAttribute*" **played by** *EmergentBindingMutualProperty*
Belongs to: 0:n [0:n], *monitoredControlledObject*
Belongs to: 0:n [0:n], *theAgent*
An *agent* monitors an *object*, without defining the concrete *attribute* of the control.
Also represented: *Monitors*.

1:n [1:n], "*monitoredExplicitObjAttribute*" **played by** *EmergentBindingMutualProperty*
Belongs to: 0:n [0:n], *monitoredControlledObject*
Belongs to: 0:n [0:n], *theAgent*
An *agent* monitors an *object* attribute.
Also represented: *Monitors*.

1:n [1:n], "*controlledImplicitObjAttribute*" **played by** *EmergentBindingMutualProperty*
Belongs to: 0:n [0:n], *monitoredControlledObject*
Belongs to: 0:1 [0:n], *theAgent*
An *agent* controls an *object*, without defining the concrete *attribute* of the control.
Also represented: *Controls*.

1:n [1:n], "*controlledExplicitObjAttribute*" **played by** *EmergentBindingMutualProperty*
Belongs to: 0:n [0:n], *monitoredControlledObject*
Belongs to: 0:1 [0:n], *theAgent*
An *agent* controls an *object* attribute.
Also represented: *Controls*.

Behaviour

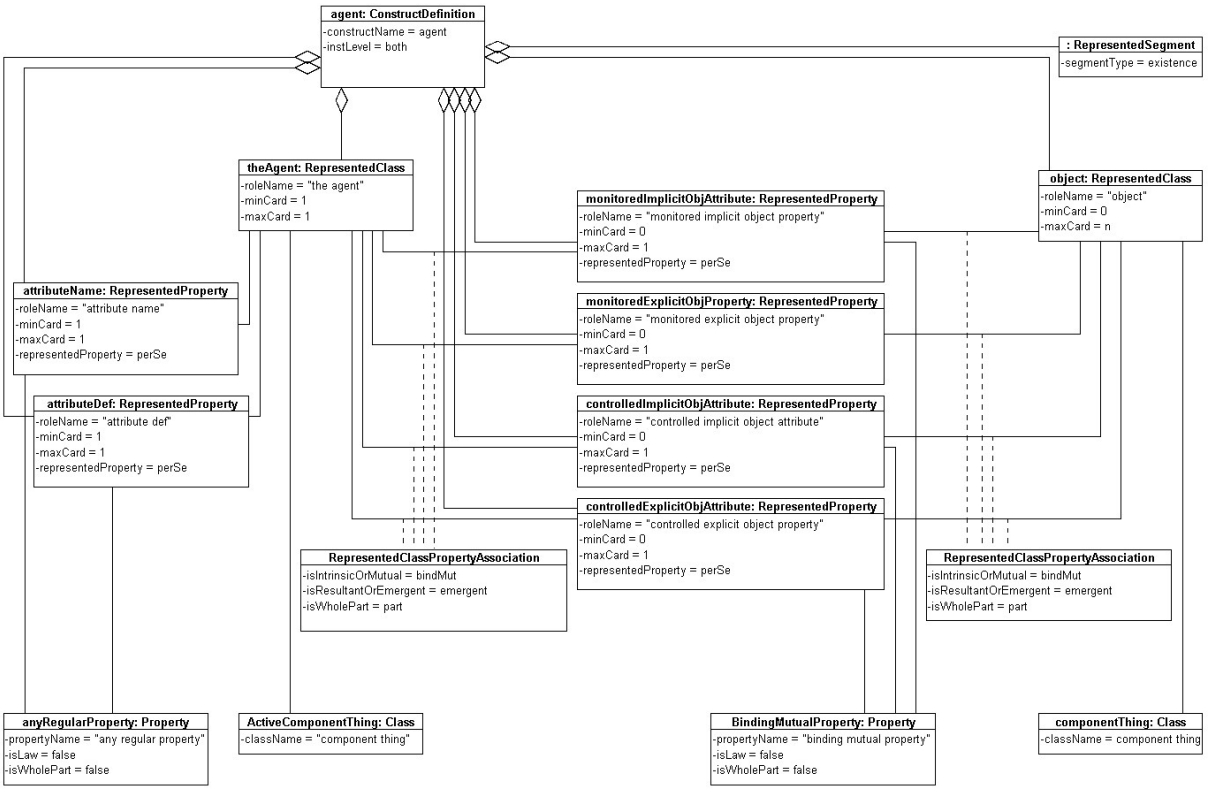
Existence

Modality (permission, recommendation etc)

Regular assertion

4. Open Issues

TBF – *Dependency* constraint between agents as through goal or through operation.
TBF – A *goal* defines a set of admissible histories in the composed system. Intuitively, a history is a temporal sequence of states of the system. Specify *Scenario*, *Snapshot*, *Interaction*, *Source*, *Target*, and *State transition* constraints. This is related to *Agent*, *Event*, and *Operation* constraints.


agent: ConstructDefinition
-constructName = agent
-instLevel = both
: RepresentedSegment
-segmentType = existence
theAgent: RepresentedClass
-roleName = "the agent"
-minCard = 1
-maxCard = 1
monitoredImplicitObjAttribute: RepresentedProperty
-roleName = "monitored implicit object property"
-minCard = 0
-maxCard = 1
-representedProperty = perSe
object: RepresentedClass
-roleName = "object"
-minCard = 0
-maxCard = n
attributeName: RepresentedProperty
-roleName = "attribute name"
-minCard = 1
-maxCard = 1
-representedProperty = perSe
monitoredExplicitObjProperty: RepresentedProperty
-roleName = "monitored explicit object property"
-minCard = 0
-maxCard = 1
-representedProperty = perSe
attributeDef: RepresentedProperty
-roleName = "attribute def"
-minCard = 1
-maxCard = 1
-representedProperty = perSe
controlledImplicitObjAttribute: RepresentedProperty
-roleName = "controlled implicit object attribute"
-minCard = 0
-maxCard = 1
-representedProperty = perSe
controlledExplicitObjAttribute: RepresentedProperty
-roleName = "controlled explicit object property"
-minCard = 0
-maxCard = 1
-representedProperty = perSe
RepresentedClassPropertyAssociation
-isIntrinsicOrMutual = bindMut
-isResultantOrEmergent = emergent
-isWholePart = part
RepresentedClassPropertyAssociation
-isIntrinsicOrMutual = bindMut
-isResultantOrEmergent = emergent
-isWholePart = part
anyRegularProperty: Property
-propertyName = "any regular property"
-isLaw = false
-isWholePart = false
ActiveComponentThing: Class
-className = "component thing"
BindingMutualProperty: Property
-propertyName = "binding mutual property"
-isLaw = false
-isWholePart = false
componentThing: Class
-className = component thing

KAOS : Assignment

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The *Assignment* is introduced as target of an OR-Assignment meta-relationship from *Goal* to capture alternative assignments of the same terminal goal to different *agents*; alternative assignments result in different system proposals in which more or less is automated.

1. Preamble

Builds on

Built on by

Construct name

Assignment

Alternative construct names

Responsibility assignment

Related, but distinct construct names

Related terms

Language

KAOS,
http://www2.info.ucl.ac.be/research/projects/AVL/ReqEng.html

Diagram type

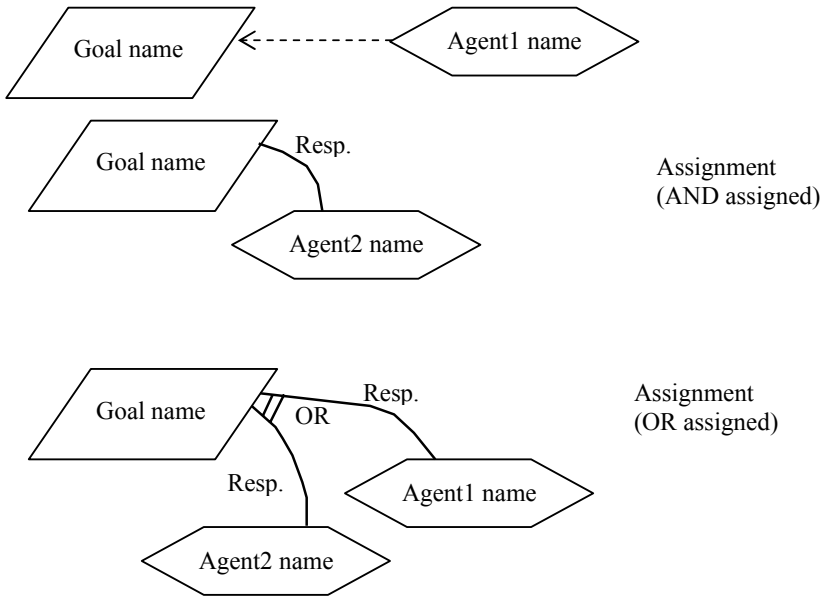
Agent model

2. Presentation

Builds on

Built on by

Icon, line style, text



User-definable attributes

[0:1] *AltName* : String = "". Name of alternative OR-assignments.

Relations to other constructs

- Belongs to 1..1 agent model.
- 1:1 [0:n], *assignedGoal*: goal. A *goal*, if it is a terminal goal, could be assigned.
- 1:1 [1:n], *responsibleAgent*: agent. Responsible agent (software agent or environment agent) is responsible for goal satisfaction.

Diagram layout conventions

Other usage conventions

3. Representation

Builds on

Goal
Agent

Built on by

Instantiation level

Instance and type level

Classes of things

1:1 "*responsibleAgent*" **played by** *ActiveComponentThing*.
Represents the responsible agent.

1:1, "*goalOwner*" **played by** *StakeholderThing*.
Describing *goal owner* which holds the goal. Class *StakeholderThing* has a characteristic *holds goal*. *StakeholderThing* is subclass of the BWW-*HumanThing*.

Properties (and relationships)

1:1, "*theGoal*" **played by** *ComplexLawProperty*.
Belongs to: 0:1 [1:1], *goalOwner*.
Law: restricts the the possible values of the *object* attributes.
Representing the goal which is held by a goal owner.

1:1, "*terminalGoal*" **played by** *StateLaw*.
Belongs to: 0:1 [1:1], *goalOwner*.
Sub-property: 1:1 [1:1], *theGoal.*
State law: $\forall g \in$ Goal, $\forall a \in$ Assignment, a.assignedGoal = g
$\Rightarrow \neg\exists$ gr $\in$ G-refinement: gr.superGoal = g
Only terminal goals can by assigned.

1:1, "*theAssignment*" **played by** *ComplexBindingMutualProperty*.
Type: *OR relationship*.
Belongs to: 1:1 [1:n] *responsibleAgent*.
Sub-property: 1:1 [0:n] *terminalGoal*.
Describing the *assignment*.

0:1, "*attributeAltName*" **played by** *AnyRegularProperty*.
Sub-property: *theAssignment*.
Represents *assignement* attribute *altName*.

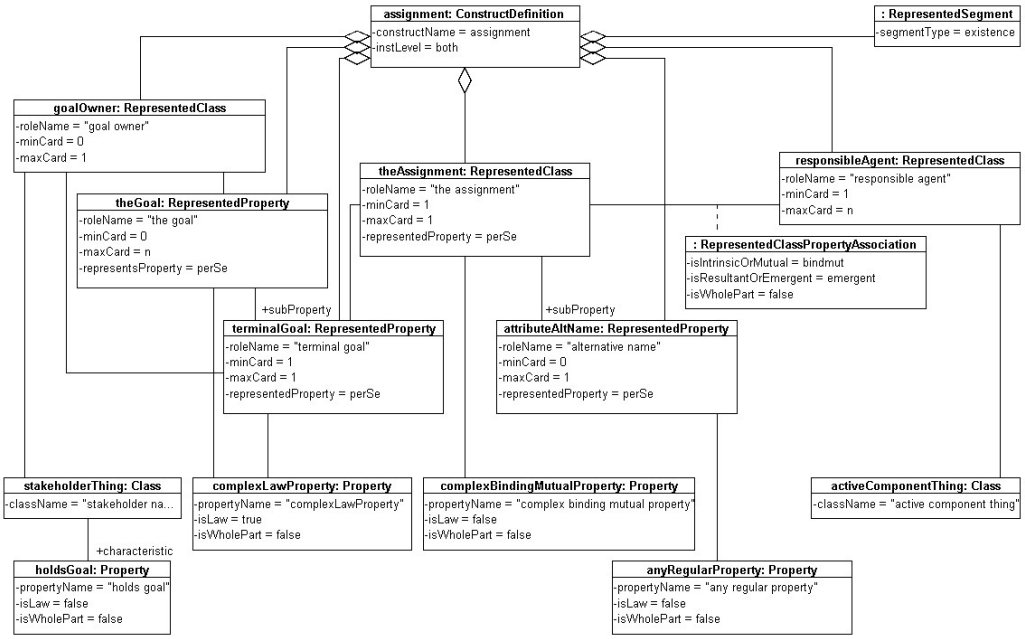
Behaviour

Existence

Modality (permission, recommendation etc)

Regular assertion

4. Open Issues



KAOS : Avoid goal

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Document history:	

Avoid goals are goals requiring that some property never holds.
Avoid goals state that some target condition on system states should never hold under some current condition.

1. Preamble

Builds on

Goal

Built on by

Construct name

Avoid goal

Alternative construct names

goal, requiring that some property never holds

Related, but distinct construct names

goal with a pattern avoid

Related terms

Goal : a prescriptive assertion capturing some objective to be met by cooperation of agents from the agent model.
Maintain goal: a goal requiring that some property always holds.
Cease goal: a goal requiring that some property eventually stops to hold.
Achieve goal: a goal requiring that some property eventually hold.

Softgoal: goal that do not have a clear-cut criterion for their satisfaction.
Terminal goals: a goal which has no G-refinement.
Requirement: a goal assigned to an agent in the software to be.
Expectation (*assumption*): a goal assigned to an agent in the environment.
Comment: Can a goal with a pattern be softgoal, terminal goal (requirement and expectation)?

Language

KAOS, http://www2.info.ucl.ac.be/research/projects/AVL/ReqEng.html

Diagram type

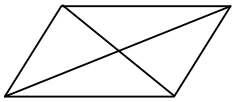
Goal model

2. Presentation

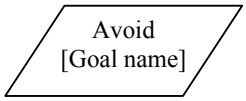
Builds on

Built on by

Icon, line style, text



Avoid goal



User-definable attributes

Relations to other constructs

Diagram layout conventions

Other usage conventions

3. Representation

Builds on

Built on by

Instantiation level

Both type and instance level

Classes of things

1:1, "*goalOwner*" **played by** *StakeholderThing*.
Describing *goal owner* which holds the goal. Class *StakeholderThing* has a characteristic *holds goal*. *StakeholderThing* is subclass of the BWW-*HumanThing*.

1:1, "*concernedObject*" **played by** *AllThing*.
Describing *object* concerned by a *goal*.

Comment: *Avoid goal* has the same classes as a *goal*. It belongs to a *goal owner* and has the sub-properties. These classes are described here as they are used in property definition.

Properties (and relationships)

1:1, "*theAvoidGoal*" **played by** *ComplexStateLaw*.
Belongs to: 0:1 [1:1], *goalOwner*.
State law: indicates states that cannot be in concerned object.
Representing the avoid goal which is held by a goal owner and requires some properties of the concerned object never holds.

Comment: For more *avoid goal* properties (such as *concExplicitObjAttribute, concImplicitObjAttribute, attributeName, attributeDef, attributeFormalSpec, attributePriority,* and *attributeCategoty*), see *goal*.

Behaviour

Existence

Modality (permission, recommendation etc)

Intention of a goal owner;

4. Open Issues

Change List

KAOS : Boundary condition

Document type:	Working document
Domain/Task/Topic:	DEM / UEML / Approaches
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Document history:	

Boundary condition describes inconsistencies in the considered domain – this means that two or more different goals could not be achieved together.

1. Preamble

Builds on

Built on by

Construct name

Boundary condition

Alternative construct names

Inconsistencies in the considered domain

Related, but distinct construct names

Related terms

Conflict

Language

KAOS,
http://www2.info.ucl.ac.be/research/projects/AVL/ReqEng.html

Diagram type

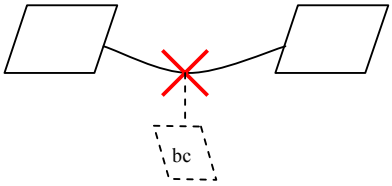
Goal model

2. Presentation

Builds on

Built on by

Icon, line style, text



Boundary condition

User-definable attributes

[1:1] *Name*: String = "". A string allowing for unambiguous reference to corresponding instances at the application level.

[1:1] *Def*: FreeText = "". Free text used for precise, unambiguous definition of the corresponding instances at the application level.

[0:1] *FormalSpec*: KAOS real time temporal logic expression. Its values at the application level specify the corresponding *Def* attribute in the KAOS real-time temporal logic.

[0:1] *Likelihood* : propability ∈ [0..1]. Its values at the application level specify how likely the boundary condition is.

[0:1]*Criticality* : set_of{critical, …, not critical}. Its values at the application level specify how severe the consequences of the resulting conflict are.

Relations to other constructs

Belongs 1:1 to goal model.

1:1 [1:1], *existUnder* : conflict. Conflict exist only under some boundary condition.

Diagram layout conventions

Other usage conventions

3. Representation

Builds on

Conflict

Built on by

Instantiation level

Instance level

Comment: can we define classes of *boundary conditions*?

Classes of things

Properties (and relationships)

1:1, "*theBoundaryCondition*" **played by** *StateLaw*.
Type: *Boolean*, **default value:** *true*.
Sub-property: 1:1 [1:1] *theConflict*.
State law: two (or more) goals in the same *G-refinement* cannot be satisfied together.
Describing *boundary condition*.

1:1 [1:1], "*attributeName*" **played by** *AnyRegularProperty*.
Sub-property: *theBoundaryCondition*.
Represents *boundary condition* attribute *name*.

1:1 [1:1], "*attributeDef*" **played by** *AnyRegularProperty*.
Sub-property: *theBoundaryCondition*.
Represents *boundary condition* attribute *def*.

1:1 [1:1], "*attributeFormalSpec*" **played by** *AnyRegularProperty*.
Sub-property: *theBoundaryCondition*.
Represents *boundary condition* attribute *formalSpec*.

0:1 [1:1], "*attributeLikelihood*" **played by** *AnyRegularProperty*.
Sub-property: *theBoundaryCondition*.
Represents *boundary condition* attribute *likelihood*.

0:1 [1:1], "*attributeCritically*" **played by** *AnyRegularProperty*.
Sub-property: *theBoundaryCondition*.
Represents *boundary condition* attribute *critically*.

Behaviour

State

"*logicalInconsistency*" **played by** *unstableState*.
Defining property: *theBoundaryCondition*,
State constraint: Two or more different goals could not be achieved together.

Modality (permission, recommendation etc)

Regular assertion

4. Open Issues

TBD – describe state law in a more formal way.

KAOS : Cease goal

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Document history:	

Cease goals are goals requiring that some property eventually stops to holds.
Cease goals state that some target condition should not hold in some (bounded) future state.

1. Preamble

Builds on

Goal

Built on by

Construct name

Cease goal

Alternative construct names

goal, requiring that some property eventually stops to hold.

Related, but distinct construct names

goal with a pattern cease

Related terms

Goal : a prescriptive assertion capturing some objective to be met by cooperation of agents from the agent model.
Maintain goal: a goal requiring that some property always holds.
Avoid goal: a goal requiring that some property never holds.
Achieve goal: a goal requiring that some property eventually hold.

Softgoal: goal that do not have a clear-cut criterion for their satisfaction.
Terminal goals: a goal which has no G-refinement.
Requirement: a goal assigned to an agent in the software to be.
Expectation (*assumption*): a goal assigned to an agent in the environment.
Comment: Can a goal with a pattern be softgoal, terminal goal (requirement and expectation)?

Language

KAOS, http://www2.info.ucl.ac.be/research/projects/AVL/ReqEng.html

Diagram type

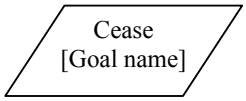
Goal model

2. Presentation

Builds on

Built on by

Icon, line style, text



Achieve goal

User-definable attributes

Relations to other constructs

Diagram layout conventions

Other usage conventions

3. Representation

Builds on

Built on by

Instantiation level

Both type and instance level

Classes of things

1:1, "*goalOwner*" **played by** *StakeholderThing*.
Describing *goal owner* which holds the goal. Class *StakeholderThing* has a characteristic *holds goal*. *StakeholderThing* is subclass of the BWW-*HumanThing*.

1:1, "*concernedObject*" **played by** *AllThing*.
Describing *object* concerned by a *goal*.

Comment: *Cease goal* has the same classes as a *goal*. It belongs to a *goal owner* and has the sub-properties. These classes are described here as they are used in property definition.

Properties (and relationships)

1:1, "*theCeaseGoal*" **played by** *ComplexTransformationLaw*.
Belongs to: 0:1 [1:1], *goalOwner*.
Trasformation law: a change is required between a state where the *concerned object* properties are *true* and one where they are *false*.
Representing the cease goal which is held by a goal owner and requires that some concerned object properties eventually stops to hold.

Comment: For more *cease goal* properties (such as *concExplicitObjAttribute, concImplicitObjAttribute, attributeName, attributeDef, attributeFormalSpec, attributePriority,* and *attributeCategoty*), see *goal*.

Behaviour

Existence

Modality (permission, recommendation etc)

Intention of a goal owner;

4. Open Issues

Change List

KAOS : Conflict

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Document history:	

Two or more goals are considered to be *conflicting* when under some boundary condition the goals become logically inconsistent in the considered domain – these goals could not be achieved together.
Goals *G1*, *G2*, ..., *Gn* are said to be *conflicting* (or "divergent") if under some boundary condition the goals become logically inconsistent in the domain considered, that is, they cannot be achieved altogether.

1. Preamble

Builds on

Built on by

Construct name

Conflict

Alternative construct names

Conflicting goals
Divergent goals

Related, but distinct construct names

Related terms

Language

KAOS,
http://www2.info.ucl.ac.be/research/projects/AVL/ReqEng.html

Diagram type

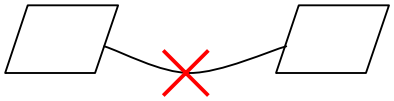
Goal model

2. Presentation

Builds on

Built on by

Icon, line style, text



Conflict

User-definable attributes

Relations to other constructs

2:n [0:n], *conflictBetweenGoals* : goals.
0:n [0:n], *isInDomain* : domain properties.
1:1 [1:1], *existUnder*: boundary condition.

Diagram layout conventions

Cross between conflicting goals is represented in red.

Other usage conventions

3. Representation

Builds on

Two or more *goal*s

Built on by

Boundary condition
Domain property

Instantiation level

Instance level
Comment: can we define classes of conflicts?

Classes of things

1:1, "*goalOwner*" **played by** *StakeholderThing*.
Describing *goal owner* which holds the goal. Class *StakeholderThing* has a characteristic *holds goal*.
StakeholderThing is subclass of the BWW-*HumanThing* (specified in *goal* template).
If goals are conflicting, this means conflict between the goal owners.

1:1, "*concernedObject*" **played by** *ComponentThing*.
Describing *object* concerned by a *goal*. This object is characterised by a *domain property*.

Properties (and relationships)

1:1, *theConflict* **played by** *MutualProperty*. Describing the *conflict*.
Sub-property of 2:n [0:n] *theGoal*.
Sub-property of 0:n [0:n] *domainHypothesis*.
Sub-property of 0:n [0:n] *domainInvariant*.
Conflict specifies mutual property between two or more goal owners (we consider what two conflicting goals have different goal owners).

Comment: *theGoal* property is specified in the template for the *goal* construct.

1:1 [1:1], *boundaryCondition* **played by** *StateLaw*
Sub-property of 1:1 [1:1] *theConflict*.
State law: *Conflict* exist under some boundary condition.
The conflict exists only if some boundary condition, which defines why two or m ore goals can not be satisfied together exists.
Also represented by: *boundary condition*.

0:n [0:n], *domainHypothesis* **played by** *AnyProperty*.
Conflicts are described in the domain which is specified by the *domain properties*.
Also represented by: *domain property*.

0:n [0:n], *domainInvariant* **played by** *AnyProperty*.

Conflicts are described in the domain which is specified by the *domain properties*.

Also represented by: *domain property*.

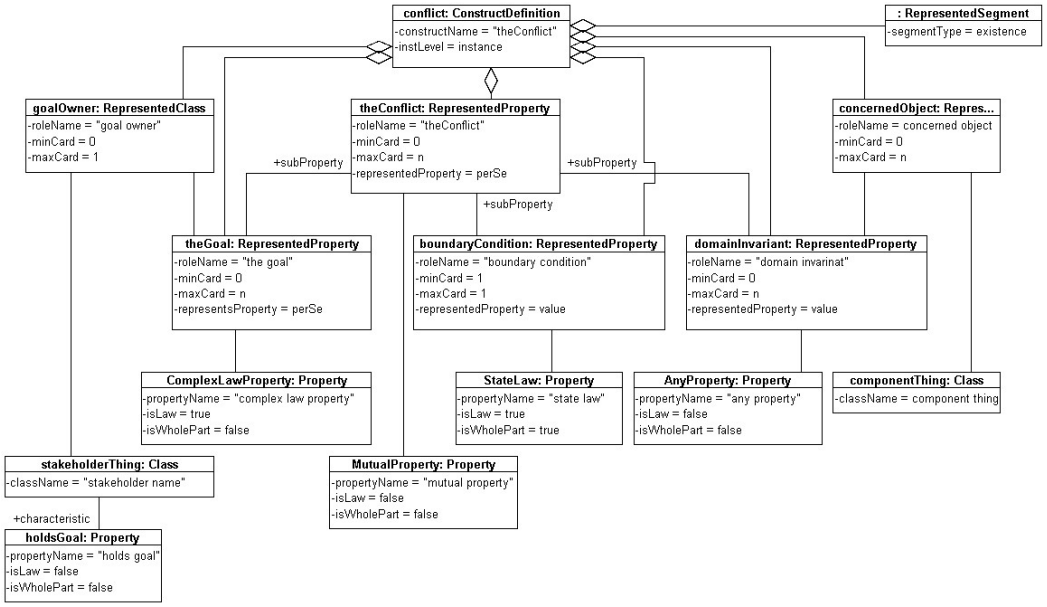
Behaviour

Regular assertion

Modality (permission, recommendation etc)

Obligation of *Boundary Condition*.

4. Open Issues



KAOS : Control

Document type:	Working document
Domain/Task/Topic:	DEM / UEML / Approaches
Version:	
Date:	2005.11.30
Status:	2nd iteration
Authors:	Raimundas Matulevičius
Distribution list:	DEM
Document history:	

Agent controls ("writes") the value of the *object* attribute.

1. Preamble

Builds on

Built on by

Construct name

Controls

Alternative construct names

Writes

Related, but distinct construct names

Related terms

Monitors : *Agent* monitors ("reads") the value of the *attribute*.

Language

KAOS,
http://www2.info.ucl.ac.be/research/projects/AVL/ReqEng.html

Diagram type

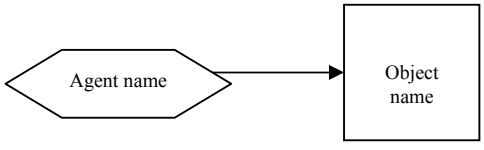
Agent model

2. Presentation

Builds on

Built on by

Icon, line style, text



Controls

User-definable attributes

- ***WhichAtt*** : String = "".indicate which attributes of the object are specifically controlled.

Relations to other constructs

- Belongs to 1..1 agent model.
- 0:n [1:1], Object. *Object* is controlled by an *agent*.
- 0:n [1:1], Agent. *Agent* controls an *object*.

Diagram layout conventions

Other usage conventions

3. Representation

Builds on

Agent
Object

Built on by

Instantiation level

Instance and type level

Classes of things

1:1 "*controlledObject*" **played by** *ComponentThing*.
Represents *object,* controlled by an agent.

1:1 "*controllingAgent*" **played by** *ActiveComponentThing*.
Represents the agent.

Properties (and relationships)

1:1, "*theControls*" **played by** *BindingMutualProperty*.
Belongs to: 1:1 [0:n], *controllingAgent*.
Describing *controls* relationship.

1:n, "*explicitObjAttribute*" **played by** *AnyProperty*.
Belongs to: *controlledObject*.
Sub-property of: *theControls*.
Defines explicitly which attribute of the object is controlled.

1:n, "*implicitObjAttribute*" **played by** *AnyProperty*.
Belongs to: *controlledObject*.
Sub-property of: *theControls*.
Does not define explicitly which attribute of the object is controlled.

Behaviour

Existence

Modality (permission, recommendation etc)

Regular assertion

4. Open Issues

KAOS : Domain property

Document type:	Working document
Domain/Task/Topic:	DEM / UEML / Approaches
Version:	
Date:	2005.11.30
Status:	2nd iteration
Authors:	Raimundas Matulevičius
Distribution list:	DEM
Document history:	

A *domain property* is a property that is naturally true about the composite system.
A *domain property* (*DomProp*) is a descriptive assertion about objects in the environment which holds independently of the software-to-be.

1. Preamble

Builds on

Built on by

Domain invariant. A *domain invariant* is a property known to hold in every state of some domain object. It is an indicative statement of domain knowledge.
Domain hypothesis. A *domain hypothesis* is a domain property about some domain object supposed to hold and used when arguing about the sufficient completeness of G-refinement.

Construct name

Domain property

Alternative construct names

A property that is naturally true about the composite system
A descriptive assertion about objects in the environment

Related, but distinct construct names

Related terms

- ***Domain invariant*** : a property known to hold in every state of some domain object
- ***Domain hypothesis*** : a property about some domain object supposed to hold and used when arguing about the sufficient completeness of goal refinements.

Language

KAOS,
http://www2.info.ucl.ac.be/research/projects/AVL/ReqEng.html

Diagram type

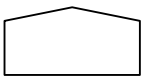
Goal model
Object model

2. Presentation

Builds on

Built on by

Icon, line style, text



Domain property

User-definable attributes

[1:1], *Name* = "". A string allowing for unambiguous reference to corresponding instances at the application level.
[1:1], *Def*: FreeText = "". Free text used for precise, unambiguous definition of the corresponding instances at the application level.
[0:1], *FormalSpec*: KAOS real time temporal logic expression. Its values at the application level specify the corresponding *Def* attribute in the KAOS real-time temporal logic.

Relations to other constructs

0:n [0:n], *subProperty*: goal. *Domain properties* refine the *goal* through the G-refinement relationship.

0:n [0:n], *isInDomain*: Conflict. *Conflicts* between goals are defined in a domain by domain properties.

Diagram layout conventions

Other usage conventions

3. Representation

Builds on

Built on by

Instantiation level

Instance level

Classes of things

1:1 "*theDomainObject*" **played by** *CompositeThing*.
Describing object to which domain property belongs.

Properties (and relationships)

1:1, "*theDomainProperty*" **played by** *AnyThing*.
Belongs to: *theDomainObject*.
Representing the domain property. *Domain property* is a property of an object.

1:1 [1:1], "*attributeName*" **played by** *AnyRegularProperty*.
Sub-property: *theDomainProperty*.
Represents *domain property* attribute *name*.

1:1 [1:1], "*attributeDef*" **played by** *AnyRegularProperty*.
Sub-property: *theDomainProperty*.
Represents *domain property* attribute *def*.

0:1 [1:1], "*attributeFormalSpec*" **played by** *AnyRegularProperty*.
Sub-property: *theDomainProperty*.
Represents *domain property* attribute *formalSpec*.

Behaviour

Existence

Modality (permission, recommendation etc)

Regular assertion

4. Open Issues

KAOS : Environment agent

Document type:	Working document
Domain/Task/Topic:	DEM / UEML / Approaches
Version:	
Date:	2005.11.30
Status:	2nd iteration
Authors:	Raimundas Matulevičius
Distribution list:	DEM
Document history:	

Environment agent (e.g., pre-existing software component, sensor, actuator, human, organizational unit, etc.)

1. Preamble

Builds on

Agent

Built on by

Construct name

Environment agent

Alternative construct names

Related, but distinct construct names

Related terms

- ***Agents*** : active objects capable of performing operations.
- ***Software agent*** : an agent in the system-to-be.

Language

KAOS,
http://www2.info.ucl.ac.be/research/projects/AVL/ReqEng.html

Diagram type

Agent model

2. Presentation

Builds on

Built on by

Icon, line style, text

Environment agent

User-definable attributes

Relations to other constructs

Diagram layout conventions

Other usage conventions

3. Representation

Builds on

Built on by

Instantiation level

Type level

Classes of things

1:1, "*isEnvironmentAgent*" **played by** *ActiveComponentThing*.
Environment agents are *agents* and inherits all agent attributes and properties.

Properties (and relationships)

Behaviour

Existence

Modality (permission, recommendation etc)

Regular assertion

4. Open Issues

KAOS : Event

Document type:	Working document
Domain/Task/Topic:	DEM / UEML / Approaches
Version:	
Date:	2005.11.30
Status:	2nd iteration
Authors:	Raimundas Matulevičius
Distribution list:	DEM
Document history:	

Event is an instantaneous object.

1. Preamble

Builds on

Object

Built on by

Construct name

Event

Alternative construct names

An instantaneous object

Related, but distinct construct names

Related terms

Object

Language

KAOS,
http://www2.info.ucl.ac.be/research/projects/AVL/ReqEng.html

Diagram type

Object model
Operation model

2. Presentation

Builds on

Built on by

Icon, line style, text

Event

User-definable attributes

Event inherits all the attributes of the object.

Relations to other constructs

Event inherits all the relationships of the object.

1:1 [1:n], *occurs* : operation. The applications of an *operation* may be caused by *event*(s).

Diagram layout conventions

Other usage conventions

3. Representation

Builds on

Built on by

Instantiation level

Instance level

Classes of things

1:1, "*theEvent*" **played by** *ChangingThing*.
Describing the *event*.

Properties (and relationships)

Behaviour

Event

REPRESENTED STATE ENTRIES

"*initialState*" **played by** *StateOfAThing*
State constraints: State constraints are defined by object implicit and explicit attributes (inputs to the *operation*).

"*resultState*" **played by** *StateOfAThing*
State constraints: State constraints are defined by object implicit and explicit attributes (outputs from the *operation*).

REPRESENTED EVENT ENTRIES

"*occur*" **played by** *EventInAThing*
From state: *initialState*
To state: *resultState*
Trigger: *reqTrig* sub-property of *operationalisation*.
Condition: *reqPre* and *reqPost* in *operationalisation* and *domPre* and *domPost* in *operation*.
Action: when event occurs the *operation* is caused.

Modality (permission, recommendation etc)

Regular assertion

4. Open Issues

TBF – A *goal* defines a set of admissible histories in the composed system. Intuitively, a history is a temporal sequence of states of the system. Specify *Scenario*, *Snapshot*, *Interaction*, *Source*, *Target*, and *State transition* constraints. This is related to *Agent*, *Event*, and *Operation* constraints.

KAOS : Expectation

Document type:	Working document
Domain/Task/Topic:	DEM / UEML / Approaches
Version:	
Date:	2005.11.30
Status:	2nd iteration
Authors:	Raimundas Matulevičius
Distribution list:	DEM
Document history:	

An *expectation* is a *goal* assigned to an *environment agent*.

1. Preamble

Builds on

Goal

Built on by

Construct name

Expectation

Alternative construct names

Assumption

Related, but distinct construct names

Terminal goal: goal which has no G-requirement.

Related terms

Requirement: a goal assigned to an agent in the software-to-be.
Softgoal: a goal that cannot be said to be satisfied in a clearcut sense.
Comment: can an expectation be a softgoal?
Maintain goal: a goal requiring that some property always holds.
Avoid goal: a goal requiring that some property never holds.
Achieve goal: a goal requiring that some property eventually hold.
Cease goal: a goal requiring that some property eventually stops to hold.

Language

KAOS,
http://www2.info.ucl.ac.be/research/projects/AVL/ReqEng.html

Diagram type

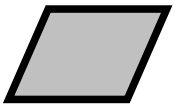
Goal model

2. Presentation

Builds on

Built on by

Icon, line style, text



Expectation

User-definable attributes

Requirement inherits all the attributes of the goal.

Relations to other constructs

- Belongs 1:1 to goal model.
- 1:n [1:n], *responsible* : *environment agent*. *Expectation* is assigned through responsibility relationship to an *environment agent*.

Diagram layout conventions

Other usage conventions

3. Representation

Builds on

Comment: *Expectation* is a goal and has most of the goal classes and properties. But *expectation* is also a terminal goal, so it has no G-refinement.

Built on by

Instantiation level

Instance level

Comment: Can we have classes of environment agents and these classes or individual expectations assigned?

Classes of things

1:1, "*environmentAgent*" **played by** *ActiveComponentThing*.
Describing the agent an *expectation* is assigned.

Properties (and relationships)

1:1, "*theExpectation*" **played by** *ComplexStateLaw*.
Belongs to: 0:1 [0:n] *environmentAgent*.
Belongs to: 0:1 [1:1] *goalOwner*.
State law: Is restricted by the assignement relationship. An expectation himself restricts state of the concerned object.
Representing the *expectation*. Expectation as a goal, has a goal owner.

1:1, "*isTerminalGoal*" **played by** *StateLaw*.
Sub-property: 1:1 [1:1], *theExpectation.*
State law: $\forall g \in$ Goal, $\forall a \in$ Assignment, a.assignedGoal = g

$\Rightarrow \neg\exists$ gr $\in$ G-refinement: gr.superGoal = g

Expectation is a terminal *goal* which means that an *expectation* can not have G-refinement.

Behaviour

Existence

Modality (permission, recommendation etc)

Intention of a goal owner;
Obligation of an *environment agent*.

4. Open Issues

KAOS : Goal

Document type:	Working document
Domain/Task/Topic:	DEM / UEML / Approaches
Version:	
Date:	2005.11.30
Status:	2nd iteration
Authors:	Raimundas Matulevičius
Distribution list:	DEM
Document history:	

A *goal* is a prescriptive assertion capturing some objective to be met by cooperation of agents from the agent model. A *goal* prescribes a set of desired behaviours. A *goal* defines an objective the composite system should meet usually through the cooperation of multiple agents.

1. Preamble

Builds on

Built on by

softgoal
maintain goal
achieve goal
cease goal
avoid goal
requirement
expectation (assumption)

Comment: All the mentioned constructs are goals having additional features to the ones defined in this template.

Construct name

Goal

Alternative construct names

a prescriptive assertion
a set of desirable behaviours
an objective a desirable system should meet
a sub-goal
a parent goal
a super goal

Related, but distinct construct names

Related terms

Softgoal: goal that do not have a clear-cut criterion for their satisfaction.
Maintain goal: a goal requiring that some property always holds.
Avoid goal: a goal requiring that some property never holds.
Achieve goal: a goal requiring that some property eventually hold.
Cease goal: a goal requiring that some property eventually stops to hold.
Terminal goals: a goal which has no G-refinement.
Requirement: a goal assigned to an agent in the software to be.
Expectation (*assumption*): a goal assigned to an agent in the environment.

Language

KAOS, http://www2.info.ucl.ac.be/research/projects/AVL/ReqEng.html

Diagram type

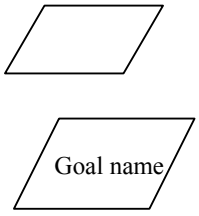
Goal model

2. Presentation

Builds on

Built on by

Icon, line style, text



Goal

User-definable attributes

[1:1] *Name*: String. A string allowing for unambiguous reference to a corresponding goal at the application level.
[1:1] *Def*: String. Free text used for precise, unambiguous definition of the goal at the application level.
[0:1] *FormalSpec*: KRTTL. Its values at the application level specify the corresponding *Def* attribute in the KAOS real-time temporal logic.
[0:1] *Priority*: PriorityType. Values at the application level specify the extent to which the goal is mandatory or optional.
[0:1] *Owner*: String. Defines stakeholder which identified and argued for that goal.
[0:1] *Category*: set_of Strings {*satisfaction*, *safety*, *security*, *information*, *accuracy*, and others}. Category provides a classification of goals that can be used to guide the acquisition, definition and refinement.
Any other attributes that the user wished to add.

Relations to other constructs

Belongs 1:1 to Goal model.
0:n [1:1] *assignedGoal* : assignment. Defines relationship between *goal* and *assignment*.
0:n [0:n] *concerns* : object. *Goal* definition refers to the *objects* and their *attributes*.
1:1 [0:n] *superGoal* : goal. *Goal* is a super (parent) goal in the *G-refinement* relationship.
0:n [1:n] *subGoal* : goal. *Goal* refines a super (parent) goal through the *G-refinement* relationship.
0:n [0:n] *subProperty* : domain properties. Super (parent) *goals* are refined to a sub*goal* and *domain properties* through the *G-refinement* relationship.
0:n [1:1] *op_goal* : operationalisation. *Operationalisation* defines *operations* which operationalise this goal through required conditions (*reqPre*, *reqTrig*, and *reqPost*).
0:n [2:n] *betweenGoals* : conflict. One or several *goals* could be part of the conflict when *boundary condition* is determined.

Diagram layout conventions

Other usage conventions

3. Representation

Builds on

Built on by

Assignment – defines how *goals* can be assigned to *agents*.
Operationalisation – defines how *goals* are operationalised.
G-refinement – defines how *goals* are refined.
Conflict – defines the way *conflicts* between *goals* are represented.

Instantiation level

Both type and instance level

Classes of things

1:1, "*concernedObject*" **played by** *AllThing*.
Describing *object* concerned by a *goal*.

1:1, "*goalOwner*" **played by** *StakeholderThing*.
Describing *goal owner* which holds the goal. Class *StakeholderThing* has a characteristic *holds goal*.
StakeholderThing is subclass of the BWW-*HumanThing*.

Properties (and relationships)

1:1, "*theGoal*" **played by** *ComplexLawProperty*.
Belongs to: 0:1 [1:1] *goalOwner*.
Law: goal restricts state of the object by concerning it.
Representing the goal which is held by a goal owner.

1:n [1:n], "*concExplicitObjAttribute*" **played by** *AnyProperty*.
Belongs to: 0:n **[**0:n**],** *concernedObject*.
Sub-property: *theGoal*.
Sub-property: *attributeDef.*
Sub-property: *attributeFormalSpec.*
A *goal* concerns an *object's attribute*.

1:n [1:n], "*concImplicitObjAttribute*" **played by** *AnyProperty*.
Belongs to: 0:n **[**0:n**],** *concernedObject*.
Sub-property: *theGoal*.
Sub-property: *attributeDef.*
Sub-property: *attributeFormalSpec.*
A *goal* concerns an *object*, without defining the concrete *attribute* of the concern.

1:1 [1:1], "*attributeName*" **played by** *AnyRegularProperty*.
Sub-property: *theGoal*.
Represents *goal* attribute *name*.

1:1 [1:1], "*attributeDef*" **played by** *AnyRegularProperty*.
Sub-property: *theGoal*.
Represents *goal* attribute *def*.

0:1 [1:1], "*attributeFormalSpec*" **played by** *AnyRegularProperty*.
Sub-property: *theGoal*.
Represents *goal* attribute *formalSpec*.

0:1 [1:1], "*attributePriority*" **played by** *AnyRegularProperty*.
Sub-property: *theGoal*.
Represents *goal* attribute *priority*.

0:1 [1:1], "*attributeCategoty*" **played by** *AnyRegularProperty*.
Sub-property: *theGoal*.
Represents *goal* attribute *category*.

Behaviour

Existence

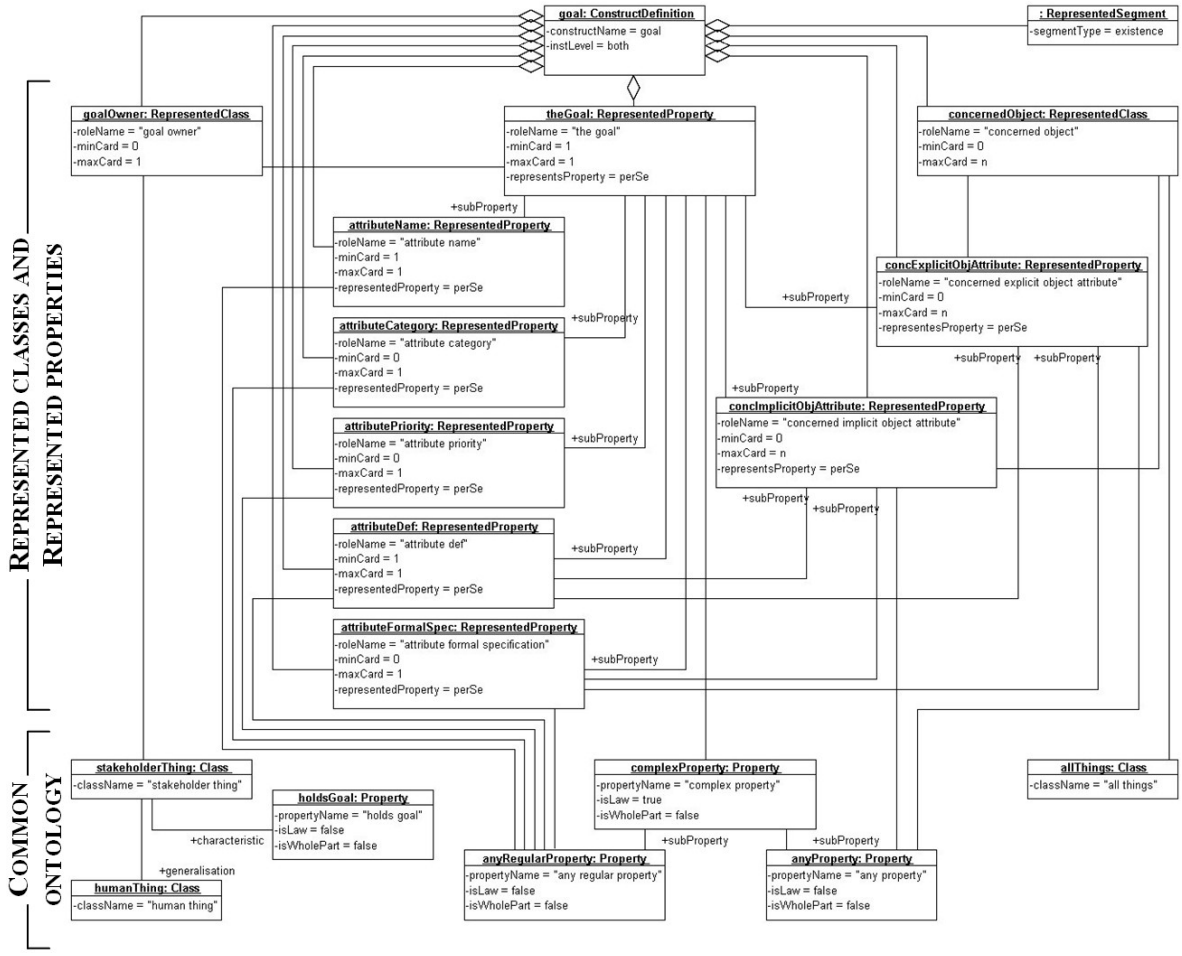
Modality (permission, recommendation etc)

Intention of a goal owner;
Obligation of an *agent*.

4. Open Issues

In this template it is not considered:

Obstacle constructs and relationship with a goal.
Dependency constructs between agents both through goal and/or through operation.
History (and its constructs) in a composed system.



KAOS : Goal refinement

Document type:	Working document
Domain/Task/Topic:	DEM / UEML / Approaches
Version:	
Date:	2005.11.30
Status:	2nd iteration
Authors:	Raimundas Matulevičius
Distribution list:	DEM
Document history:	

Goals refinement is a relationship which is used to refine *goals* to sub*goals* and to *domain properties*. Parent *goal* could have alternative refinements.

1. Preamble

Builds on

OR-refinement
AND-refinement

Built on by

Construct name

Goal refinement

Alternative construct names

Refines
G-refinement

Related, but distinct construct names

Related terms

Language

KAOS,
http://www2.info.ucl.ac.be/research/projects/AVL/ReqEng.html

Diagram type

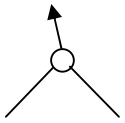
Goal model

2. Presentation

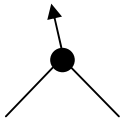
Builds on

Built on by

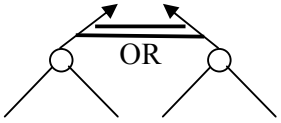
Icon, line style, text



G-refinement (AND refinement)



Complete G-refinement (AND refinement)



G-refinement (OR refinement)

User-definable attributes

[1:1]*Complete*: Boolean. Indicate whether the refinement is *arguably sufficient* (value "complete") or not arguably sufficient (value "undetermined") to satisfy the parent goal.

[0:1] *Tactics*: set_of{IntroduceMileston, DecomposeAntecedentByCase, IntroduceAccuracyGoal} document the tactics used for refining the parent goal. Values include IntroduceMileston, DecomposeAntecedentByCase, IntroduceAccuracyGoal.

[0:1] *AltName*: String =“”. To name the corresponding alternative for further reference. In case a goal is refined into multiple alternative G-refinements this meta-attribute is mandatory.

Relations to other constructs

- Belongs to 1..1 Goal model.
- 1:1 [1:1], Goal. *G-refinement* is used to refine a parent *goal*.
- 1:n [1:1], Goal. *G-refinement* refines parent goal to several sub*goals.*
- 1:n [1:1], Domain property. *G-refinement* refines parent goal to subgoals and *domain properties*.

Diagram layout conventions

Other usage conventions

3. Representation

Builds on

Goal

Built on by

Domain property

Instantiation level

Instance and type levels

Classes of things

1:1, “*goalOwner*” **played by** *StakeholderThing*.
Describing *goal owner* which holds the goal. Class *StakeholderThing* has a characteristic *holds goal*.

StakeholderThing is subclass of the BWW-*HumanThing* (specified in *goal* template).
G-refinement is a mutual relationtion between goal owners.

1:1, "*concernedObject*" **played by** *ComponentThing*.
Describing *object* concerned by a *goal*. This object is characterised by a *domain properties* – either domain invariant or domain hypothesis.

Properties (and relationships)

1:1, "*theGoal*" **played by** *ComplexLawProperty*.
Belongs to: 0:1 [1:1], *goalOwner*.
Law: restricts the the possible values of the *object* attributes.
Representing the goal which is held by a goal owner.

1:1 [0:n], *superGoal* **played by** *ComplexLawProperty*.
Sub-property: 0:1 [1:1] *theGoal*.
Supergoal is refined by the subgoals. Like a goal, it is complex (has attributes) and law property (has restrictions over the concerned object –see goal template).

1:n [0:n], *subGoal* **played by** *ComplexLawProperty*.
Sub-property: 1:1 [1:1] *theGoal*.
Subgoals refine the super goal. Like goals they are complex (have attributes) and law properties (have restrictions over the concerned object –see goal template).

0:n [0:n], *domainHypothesis* **played by** *AnyProperty*.
A *domain hypothesis* is a domain property about some domain object supposed to hold and used when arguing about the sufficient completeness of G-refinement.
Also represented by: *domain property*.

0:n [0:n], *domainInvarinat* **played by** *AnyProperty*.
A *domain invariant* is a property known to hold in every state of some domain object. It is an indicative statement of domain knowledge.
Also represented by: *domain property*.

1:1, "*theG-Refinement*" **played by** *ComplexMutualProperty*.
Type: *AND/OR relationship*.
Sub-property: 0:n [1:1] *domainHypothesis*.
Sub-property: 0:n [1:1] *domainInvariant*.
Sub-property: 1:1 [1:1] *superGoal*.
Sub-property: 0:n [1:1] *subGoal*
Describing *goal refinement*.

1:1 [1:1], "*attributeComplete*" **played by** *AnyRegularProperty*.
Sub-property: *theG-Refinement*.
Represents *G-refinement* attribute *complete*.

0:1 [1:1], "*attributeAltName*" **played by** *AnyRegularProperty*.
Sub-property: *theG-Refinement*.
Represents *G-refinement* attribute *altName*.

0:1 [1:1], "*attributeTactics*" **played by** *AnyRegularProperty*.
Sub-property: *theG-Refinement*.
Represents *G-refinement* attribute *tactics*.

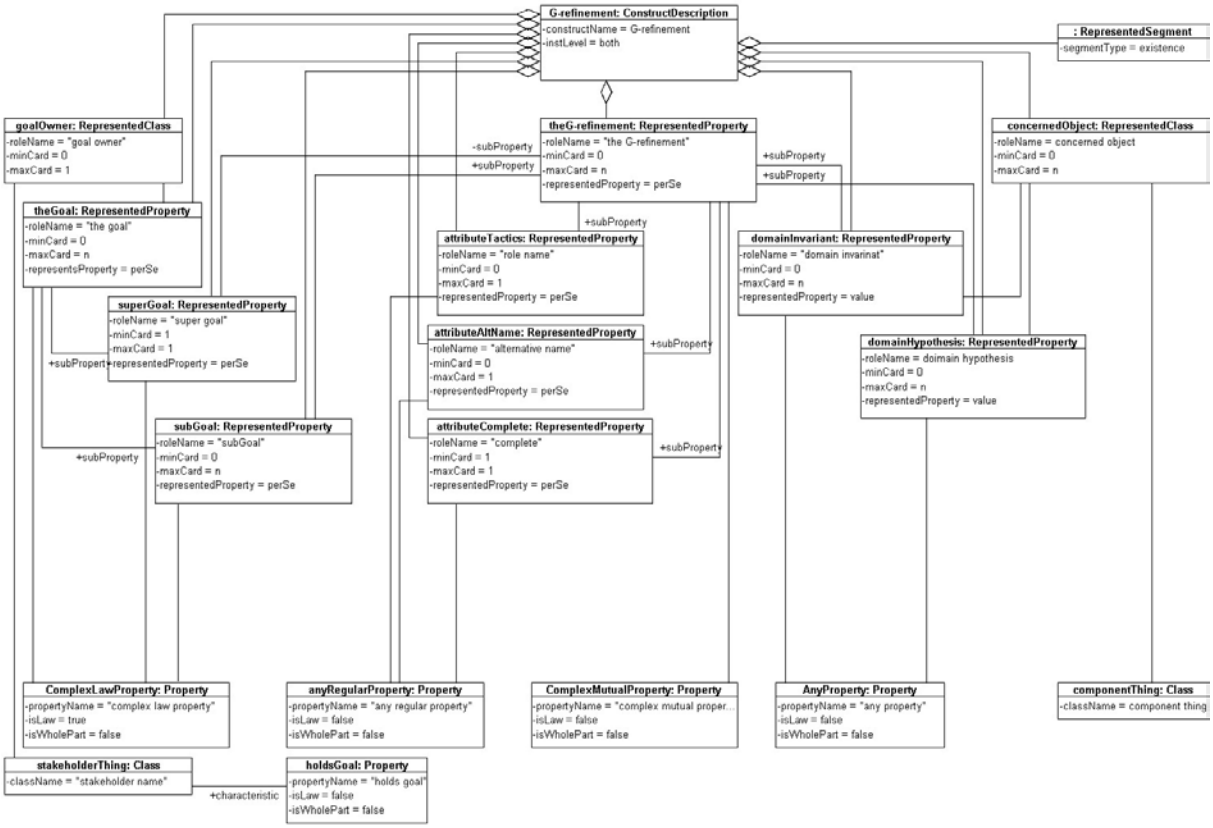
Behaviour

Existence

Modality (permission, recommendation etc)

Regular assertion

4. Open Issues



KAOS : Input

Document type:	Working document
Domain/Task/Topic:	DEM / UEML / Approaches
Version:	
Date:	2005.11.30
Status:	2nd iteration
Authors:	Raimundas Matulevičius
Distribution list:	DEM
Document history:	

An object is among the *inputs* of an operation if it is among the sorts making up the domain of the relation defined by the operation.

1. Preamble

Builds on

Built on by

Construct name

Inputs

Alternative construct names

Related, but distinct construct names

Related terms

Outputs : An object is among the *outputs* of an operation if it is among the sorts making up the co-domain of the relation defined by the operation.

Language

KAOS,
http://www2.info.ucl.ac.be/research/projects/AVL/ReqEng.html

Diagram type

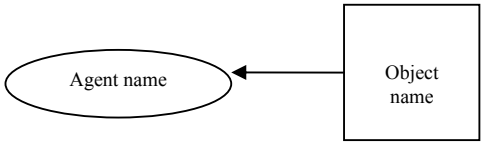
Operation model

2. Presentation

Builds on

Built on by

Icon, line style, text



Inputs

User-definable attributes

[0:1] *WhichAtt* : String = "". Indicate which attributes of the object are specifically taken as input of the operation.

Relations to other constructs

- Belongs to 1..1 operation model.
- 0:n [1:1], Object. *Object* is input to an *operation.*
- 0:n [1:1], Operation. *Operation* has input an *object*.

Diagram layout conventions

Other usage conventions

3. Representation

Builds on

Built on by

Instantiation level

Type level

Classes of things

1:1 "*inObject*" **played by** *ComponentThing*.
Represents *object,* which is input to operation.

0:n, "*causingEvent*" **played by** *ChangingThing*.

Properties (and relationships)

1:1, "*theInput*" **played by** *BindingMutualProperty*.
Belongs to: 0:n [1:1], *inObject*.
Describing *input*. Input is a binding mutual property between the event which causes the operation and the object which is input to this operation.

1:n, "*explicitObjAttribute*" **played by** *AnyProperty*.
Belongs to: *inObject*.
Sub-property of: *theInput*.
Defines explicitly which attribute of the object is an input.

1:n, "*implicitObjAttribute*" **played by** *AnyProperty*.
Belongs to: *inObject*.
Sub-property of: *theInput*.
Does not define explicitly which attribute of the object is an input.

0:1, "*attributeWhichAtt*" **played by** *AnyRegularProperty*.
Sub-property: *theInput*.
Representing the *input* attribute *whichAtt*.

0:n [1:1], "*forOperation*" **played by** *TransformationLaw*.
Belongs to: *causingEvent*.
Sub-property: *theInput*.
Transformation law: operation gets input.
Describing the operation which has input.
Also represented by *operation*.

Behaviour

Existence

Modality (permission, recommendation etc)

Regular assertion

4. Open Issues

KAOS : Maintain goal

Document type:	Working document
Domain/Task/Topic:	DEM / UEML / Approaches
Version:	
Date:	2005.11.30
Status:	2nd iteration
Authors:	Raimundas Matulevičius
Distribution list:	DEM
Document history:	

Maintain goals are goals requiring that some property always holds
Maintain goals state that some target condition on system states should always hold under some current condition.

1. Preamble

Builds on

Goal

Built on by

Construct name

Maintain goal

Alternative construct names

goal, requiring that some property always holds

Related, but distinct construct names

goal with a pattern maintain

Related terms

Goal : a prescriptive assertion capturing some objective to be met by cooperation of agents from the agent model.
Cease goal: a goal requiring that some property eventually stops to hold.
Achieve goal: a goal requiring that some property eventually hold.
Avoid goal: a goal requiring that some property never holds.

Softgoal: goal that do not have a clear-cut criterion for their satisfaction.
Terminal goals: a goal which has no G-refinement.
Requirement: a goal assigned to an agent in the software to be.
Expectation (*assumption*): a goal assigned to an agent in the environment.

Comment: Can a goal with a pattern be softgoal, terminal goal (requirement and expectation)?

Language

KAOS, http://www2.info.ucl.ac.be/research/projects/AVL/ReqEng.html

Diagram type

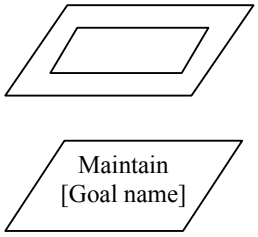
Goal model

2. Presentation

Builds on

Built on by

Icon, line style, text



Maintain goal

User-definable attributes

Relations to other constructs

Diagram layout conventions

Other usage conventions

3. Representation

Builds on

Built on by

Instantiation level

Both type and instance level

Classes of things

1:1, "*goalOwner*" **played by** *StakeholderThing*.
Describing *goal owner* which holds the goal. Class *StakeholderThing* has a characteristic *holds goal*. *StakeholderThing* is subclass of the BWW-*HumanThing*.

1:1, "*concernedObject*" **played by** *AllThing*.
Describing *object* concerned by a *goal*.

Comment: *Maintain goal* has the same classes as a *goal*. It belongs to a *goal owner* and has the sub-properties. These classes are described here as they are used in property definition.

Properties (and relationships)

1:1, "*theMaintainGoal*" **played by** *ComplexStateLaw*.
Belongs to: 0:1 [1:1], *goalOwner*.
State law: indicates states that cannot be in concerned object.
Representing the maintain goal which is held by a goal owner and requires that some properties of the concerned object always holds.

Comment: For more *avoid goal* properties (such as *concExplicitObjAttribute, concImplicitObjAttribute, attributeName, attributeDef, attributeFormalSpec, attributePriority,* and *attributeCategoty*), see *goal*.

Behaviour

Existence

Modality (permission, recommendation etc)

Intention of a goal owner;

4. Open Issues

Change List

KAOS : Monitor

Document type:	Working document
Domain/Task/Topic:	DEM / UEML / Approaches
Version:	
Date:	2005.11.30
Status:	2nd iteration
Authors:	Raimundas Matulevičius
Distribution list:	DEM
Document history:	

Agent monitors ("reads") the value of the *attribute*.

1. Preamble

Builds on

Built on by

Construct name

Monitors

Alternative construct names

Reads

Related, but distinct construct names

Related terms

Controls : *agent* controls ("writes") the value of the *object* attribute.

Language

KAOS,
http://www2.info.ucl.ac.be/research/projects/AVL/ReqEng.html

Diagram type

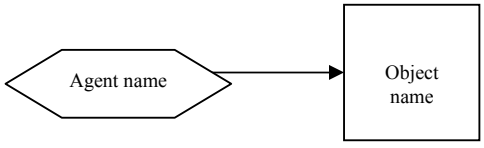
Agent model

2. Presentation

Builds on

Built on by

Icon, line style, text



Monitors

User-definable attributes

- ***WhichAtt*** : String = "".indicate which attributes of the object are specifically monitored.

Relations to other constructs

- 0:n [1:1], Object. *Object* is monitored by an *agent*.
- 0:n [1:1], Agent. *Agent* monitors an *object*.

Diagram layout conventions

Other usage conventions

3. Representation

Builds on

Built on by

Instantiation level

Instance level

Classes of things

1:1 "*monitoredObject*" **played by** *ComponentThing*.
Represents *object,* monitored by agent.

1:1 "*monitoringAgent*" **played by** *ActiveComponentThing*.
Represents the agent.

Properties (and relationships)

1:1, "*theMonitors*" **played by** *BindingMutualProperty*.
Belongs to: 1:1 [0:n], *monitoringAgent*.
Describing *monitors* relationship.

1:n, "*explicitObjAttribute*" **played by** *AnyProperty*.
Belongs to: *monitoredObject*.
Sub-property of: *theMonitors*.
Defines explicitly which attribute of the object is monitored.

1:n, "*implicitObjAttribute*" **played by** *AnyProperty*.
Belongs to: *monitoredObject*.
Sub-property of: *theMonitors*.
Does not define explicitly which attribute of the object is monitored.

Behaviour

Existence

Modality (permission, recommendation etc)

Regular assertion

4. Open Issues

KAOS : Object

Document type:	Working document
Domain/Task/Topic:	DEM / UEML / Approaches
Version:	
Date:	2005.11.30
Status:	2nd iteration
Authors:	Raimundas Matulevičius
Distribution list:	DEM
Document history:	

An *object* is a thing of interest in the system being modeled whose instances can be distinctly identified and may evolve from state to state.
An *object* instance is a thing that can be distinctly identified. A domain-level object describes a set of such instances that share some common characteristics.

1. Preamble

Builds on

Built on by

Construct name

Object

Alternative construct names

a thing of interest
a thing that can be distinctly identified

Related, but distinct construct names

Related terms

Agent
Entity
Event
Relationship

Language

KAOS,
http://www2.info.ucl.ac.be/research/projects/AVL/ReqEng.html

Diagram type

Object model

2. Presentation

Builds on

Built on by

Icon, line style, text

User-definable attributes

[1:1] *Name* : String =””.A string allowing for unambiguous reference to corresponding instances at the application level. The *name* of the object is used to identify the object.

[1:1] *Def* : Text = “”. Tree text used for precise, unambiguous definition of the corresponding instances at the application level. The *definition* of an object is a natural language statement that should provide a precise interpretation for the set member(Obj), so that one can tell whether or not a particular object instance is currently an instance of the domain-level object.

[0:1] *Alive* : Boolean = ”True/False”.Value in some state at the instance level indicates whether or not the corresponding object instance *exists* in that state, that is, has appeared in the system without disappearing yet.

Relations to other constructs

- Belongs 1:1 to object model.
- 0:n [0:n], *concerns* : goal. Goals *concern* objects - this means that their formulation in Def refers to these objects and their attributes.
- 1:n [0:n], *input* : operation. *Operations* are related to *objects* through *input* links.
- 1:n [0:n], *output* : operation. *Operations* are related to *objects* through *output* links.
- 0:n [0:n], *monitors* : agent. An *agent* monitors an *object* if the states of the object are directly observable by it.
- 0:n [0:n], *controls* : agent. An *agent* controls an *object* if the states of the object are directly controllable by it.

Diagram layout conventions

Other usage conventions

3. Representation

Builds on

Built on by

Instantiation level

Both type and instance level

Classes of things

1:1, “*theObject*” **played by** *ComponentThing*.

Properties (and relationships)

1:1 [1:1], “*attributeName*” **played by** *AnyRegularProperty*.
Sub-property: *theGoal*.
Represents *goal* attribute *name*.

1:1 [1:1], “*attributeDef*” **played by** *AnyRegularProperty*.
Sub-property: *theGoal*.
Represents *goal* attribute *def*.

Behaviour

Existence

Modality (permission, recommendation etc)

Regular assertion

4. Open Issues

KAOS : Operation

Document type:	Working document
Domain/Task/Topic:	DEM / UEML / Approaches
Version:	
Date:	2005.11.30
Status:	2nd iteration
Authors:	Raimundas Matulevičius
Distribution list:	DEM
Document history:	

An *operation* is an input-output relation over *objects*; operation applications define state transitions. *Operations* are characterized by pre-, post-, and trigger conditions. A distinction is made between *domain* pre-/post- conditions, which capture the elementary state transitions defined by *operation* applications in the domain, and *required* pre/trigger/ postconditions, which capture additional strengthening to ensure that the goals are met.

1. Preamble

Builds on

Built on by

Construct name

Operation

Alternative construct names

An input-output relation

Related, but distinct construct names

Related terms

Language

KAOS,
http://www2.info.ucl.ac.be/research/projects/AVL/ReqEng.html

Diagram type

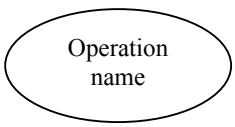
Operation model

2. Presentation

Builds on

Built on by

Icon, line style, text



Operation

User-definable attributes

[1:1] *Name*: String = "". A string allowing for unambiguous reference to corresponding instances at the application level.
[1:1] *Def*: FreeText = "". Free text used for precise, unambiguous definition of the corresponding instances at the application level.
[0:1] *modifier*: Boolean. Indicate whether the operation is an object *Modifier* or *Observer*.

Relations to other constructs

Belongs 1:1 to goal model.
1:1 [0:n] ***operationalise*** : goal. *Goals* assigned to agents are *operationalised* through *operations*. The operationalisation of a goal through some operation entails permissions and obligations on the operation's applications; the latter are captured by the *ReqPre*, *ReqPost* and *ReqTrig* metaattributes of the *Operationalisation* relationship that strengthen the operation's *domain pre/postconditions*.
0:n [1:n] ***input*** : object. *Operations* are related to *objects* through input links.
0:n [1:n] ***output*** : object. *Operations* are related to *objects* through output links.
1:n [1:1] ***occurs*** : event. The applications of an *operation* may be caused by *event*(s). This means that the *operation*'s ReqTrig includes a predicate *occurs* on instances of that *event*.
1:n [1:n] ***performs*** : agent. A meta-model constraint requires any agent *Responsible* for some goal to *Perform* all the operations that *Operationalize* that goal in accordance with the permissions and obligations specified in the operation's ReqPre, ReqTrig and ReqPost conditions. The *Performance* meta-relationship is thus a derived one.

Diagram layout conventions

Other usage conventions

3. Representation

Builds on

Built on by

Instantiation level

Type level

Classes of things

1:n, "*causingEvent*" **played by** *ChangingThing*.
Operation is caused by event(s).

1:1, "*op_object*" **played by** *ComponentThing*.
Operation gets input from and makes output to the object.

Properties (and relationships)

0:n [0:n] "*inputForOperation*" **played by** *BindingMutualProperty***.**
Belongs to: *op_object*.
Describing input for operation.
Also represented by: *Inputs*.

0:n [0:n] "*outputForOperation*" **played by** *BindingMutualProperty***.**
Belongs to: *op_object*.
Describing output for operation.
Also represented by: *Outputs*.

1:1, "*theOperation*" **played by** *TransformationLaw*.
Belongs to: *causingEvent*.
Sub-property of: *inputForOperation*.

Sub-property of: *outputFromOperation*.
Transformation law: operation is performed by an agent responsible for the goal fulfilment. Whenever the required conditions hold, performing the operations satisfies the goal.
Representing the operation.

1:1, "*attributeName*" **played by** *AnyRegularProperty*.
Sub-property of: *theOperation*.
Represents *operation* attribute *name*.

1:1, "*attributeDef*" **played by** *AnyRegularProperty*.
Sub-property of: *theOperation*.
Represents *operation* attribute *altName*.

0:1, "*modifier*" **played by** *AnyRegularProperty*.
Sub-property of: *theOperation*.
Represents *operation* attribute *altName*.

1:1 [1:1] "*domPre*" **played by** *StateLaw*.
Sub-property of: 1:1 [1:1] *operation*.
Characterising the states before any application of the operation;

1:1 [1:1] "*domPost*" **played by** *StateLaw*.
Sub-property of: 1:1 [1:1] *operation*.
Defining a relation between states before and after applications of the operation;

Behaviour

Process

REPRESENTED STATE ENTRIES

"*initState*" **played by** *StateOfAThing,*
Defining property: *inputForOperation*.
State constraint: *implicit and explicit attribute of an object*.

"*resultState*" **played by** *StateOfAThing*,
Defining property: *outputForOperation*
state constraint: *implicit and explicit attributes of an object*.

REPRESENTED EVENT ENTRIES

"*eventOccurs*" **played by** *ExternalEvent*,
From state: *initState*
To state: *initState*
Trigger: *reqTrig* sub-property of *operationalisation*.
Condition: *reqPre* **(**sub-property of *operationalisation***)** and *domPre* (sub-property of *operation*) holds.
Action: operation is initiated**,**
effected by *Event*.

"*getInput*" **played by** *InternalEvent*,
From state: *initState*
To state: *initState*
Trigger: *reqTrig* sub-property of *operationalisation*.
Condition: *reqPre* **(**sub-property of *operationalisation***)** and *domPre* (sub-property of *operation*) holds.
reqPost **(**sub-property of *operationalisation***)** and *domPost* (sub-property of *operation*) introduced.
Action: object implicit and explicit attributes are taken as the input for the operation.

"*setOutput*" **played by** *InternalEvent*,
From state: *initState*
To state: *resultState*
Trigger: *reqTrig* sub-property of *operationalisation*.

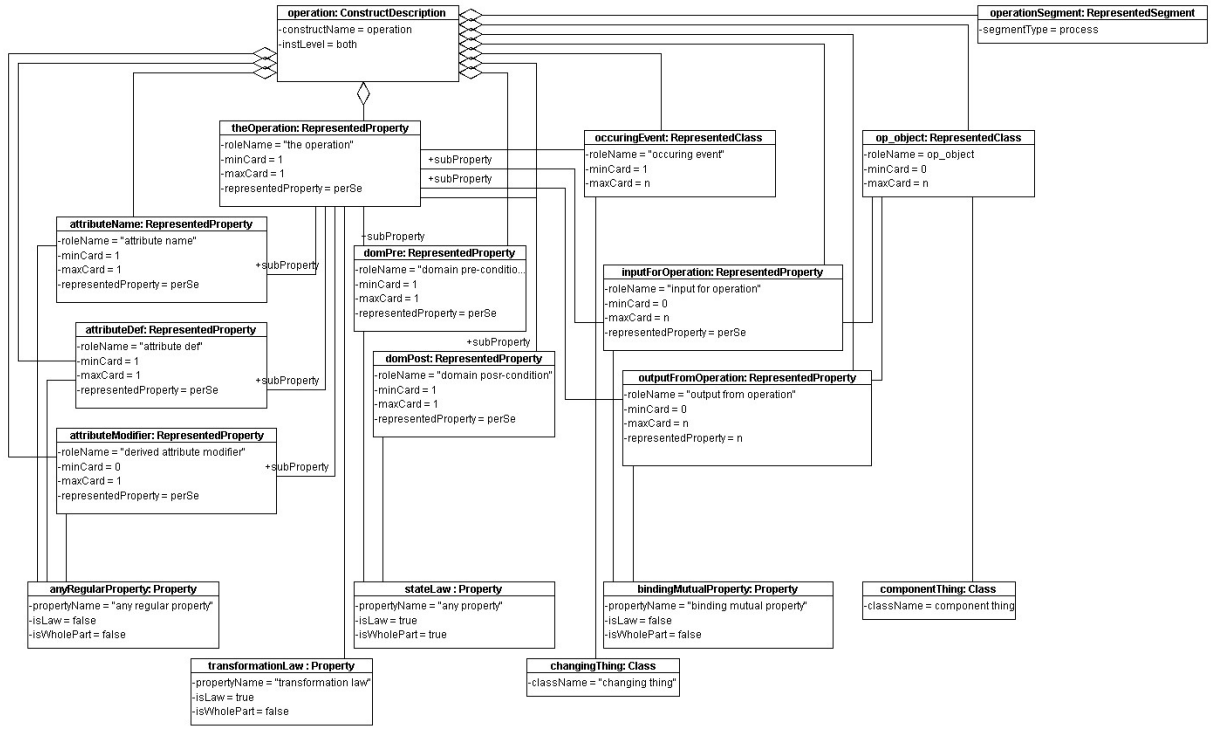
Condition: *reqPost* **(**sub-property of *operationalisation***)** and *domPost* (sub-property of *operation*) holds.
Action: object explicit and implicit attributes are taken as the input for the operation.

Modality (permission, recommendation etc)

Regular assertion

4. Open Issues

TBF – *Dependency* constraint between agents as through goal or through operation.
TBF – A *goal* defines a set of admissible histories in the composed system. Intuitively, a history is a temporal sequence of states of the system. Specify *Scenario*, *Snapshot*, *Interaction*, *Source*, *Target*, and *State transition* constraints. This is related to *Agent*, *Event*, and *Operation* constraints.



KAOS : Operationalisation

Document type:	Working document
Domain/Task/Topic:	DEM / UEML / Approaches
Version:	
Date:	2005.11.30
Status:	2nd iteration
Authors:	Raimundas Matulevičius
Distribution list:	DEM
Document history:	

The *Operationalisation* meta-relationship is an AND/OR relationship between goals and required pre, trigger, and post conditions of operations. Intuitively, a set of required pre, trigger, and post conditions operationalises a goal if satisfying the required conditions on operations guarantees that the goal is satisfied.

1. Preamble

Builds on

Built on by

Construct name

Operationalisation

Alternative construct names

Related, but distinct construct names

Related terms

Language

KAOS,
http://www2.info.ucl.ac.be/research/projects/AVL/ReqEng.html

Diagram type

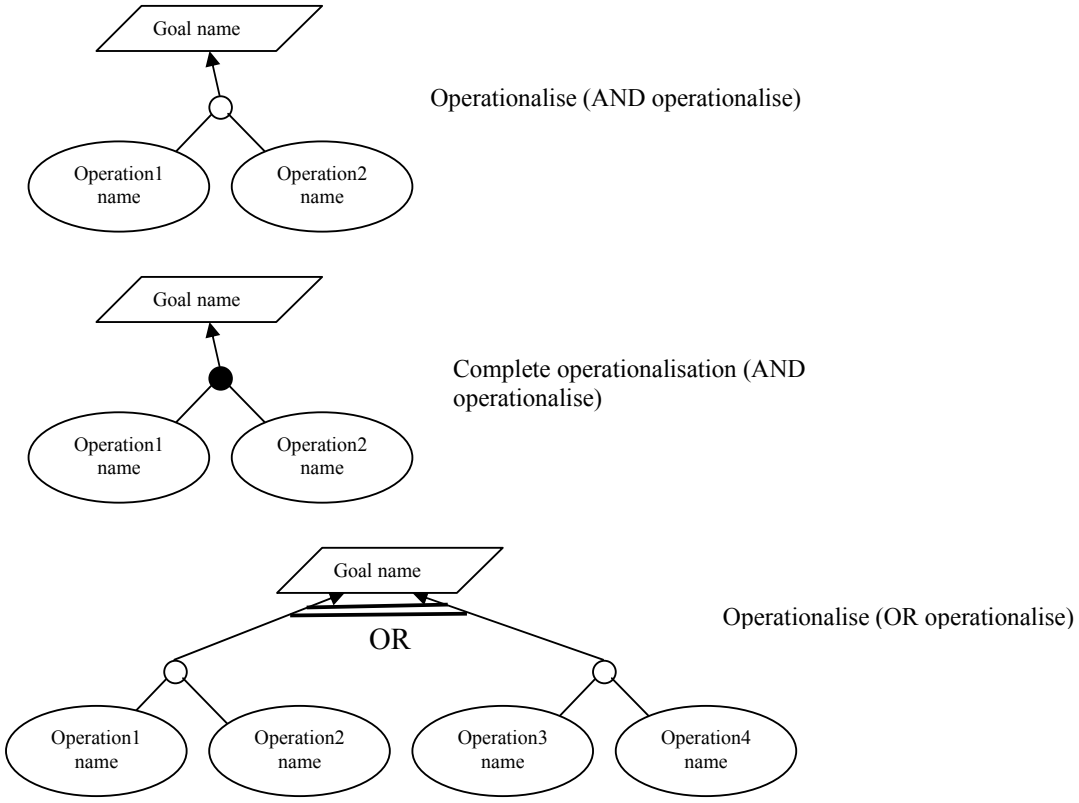
Operation model

2. Presentation

Builds on

Built on by

Icon, line style, text



User-definable attributes

[1:1]***Complete***: Boolean. Indicate whether the operationalisation is *arguably sufficient* (value "complete") or not arguably sufficient (value "undetermined").

[0:1] ***AltName***: String =“”. To name the corresponding alternative for further reference. In case a goal is operationalised into multiple alternative operationalisations this meta-attribute is mandatory.

Relations to other constructs

Belongs to 1..1 operation model.

1:1 [1:1], op_goal. *Goal* is operationalised through the *operation*.

0:n [1:1], op_operation. *Operation* operationalises the *goal*.

Diagram layout conventions

Other usage conventions

3. Representation

Builds on

Goal

Operation

Built on by

Instantiation level

Instance and type level

Classes of things

1:1, "*goalOwner*" **played by** *StakeholderThing*.
Describing *goal owner* which holds the goal. Class *StakeholderThing* has a characteristic *holds goal*. *StakeholderThing* is subclass of the BWW-*HumanThing* (specified in *goal* template).

1:1, "*occurringEvent*" **played by** *ChangingThing*.
Operationalisation's *reqTrig* includes a predicate *Occurs* on instances of that event.

1:1, "*op_object*" **played by** *ComponentThing*.
Operation gets inputs as object attributes and produces outputs as object attributes.

Properties (and relationships)

1:1, "*theGoal*" **played by** *ComplexLawProperty*.
Belongs to: 0:1 [1:1], *goalOwner*.
Law: restricts the the possible values of the *object* attributes.
Representing the goal which is held by a goal owner.

1:1, "*terminalGoal*" **played by** *ComplexLawProperty*.
Sub-property: 1:1 [1:1], *theAssignedGoal.*
State law: $\forall g \in$ Goal, $\forall a \in$ Assignment, a.assignedGoal = g
$\Rightarrow \neg\exists$ gr $\in$ G-refinement: gr.superGoal = g
Only terminal goals can by assigned.

1:1, "*operationalisedOperation*" **played by** *TransformationLaw*.
Sub-property: *inputForOperation*.
Sub-property: *outputForOperation*.
Belongs to: 0:n[0:n] *occurringEvent*.
Transformation law: operation changes the states of the object.
Describing the operationalised operation.
Also represented by *operation*.

0:n [0:n] "*inputForOperation*" **played by** *BindingMutualProperty***.**
Belongs to: *op_object*.
Describing input for operation.
Also represented by: *Inputs*.

0:n [0:n] "*outputForOperation*" **played by** *BindingMutualProperty***.**
Belongs to: *op_object*.
Describing output for operation.
Also represented by: *Outputs*.

1:1, "*theOperationalisation*" **played by** *ComplexMutualProperty*.
Type: *AND/OR relationship*.
Sub-property: 1:1[0:n] *terminalGoal*.
Describing *operationalisation*. Operationalisation is a complex mutual property between goal owner, object and event.

1:1 [1:1], "*attributeComplete*" **played by** *AnyRegularProperty*.
Sub-property: *theOperationalisation*.
Represents *operationalisation* attribute *complete*.

0:1 [1:1], "*attributeAltName*" **played by** *AnyRegularProperty*.
Sub-property: *theOperationalisation*.
Represents *operationalisation* attribute *altName*.

1:n [1:1], "*op_operation*" **played by** *ComplexProperty*.
Sub-property: 1:1 [1:n] *theOperationalisation*.
Sub-property: 1:1 [1:n] *operationalisedOperation*.

1:1 [1:1] "*reqPre*" **played by** *StateLaw*.
Sub-property: 1:1 [1:1] *op_operation*.
Necessary condition that needs to be true when the operation is applied for the corresponding operationalised goal to be satisfied.

1:1 [1:1] "*reqPost*" **played by** *StateLaw*.
Sub-property: 1:1 [1:1] *op_operation*.
Condition that needs to be established by the operation in its final state for the corresponding operationalised goal to be satisfied.

1:1 [1:1] "*reqTrig*" **played by** *TransformationLaw*.
Sub-property: 1:1 [1:1] *op_operation*.
Sub-property: 0:n [0:n] *occuringEvent*.
Sufficient condition that requires the operation to be immediately applied for the corresponding operationalised goal to be satisfied.

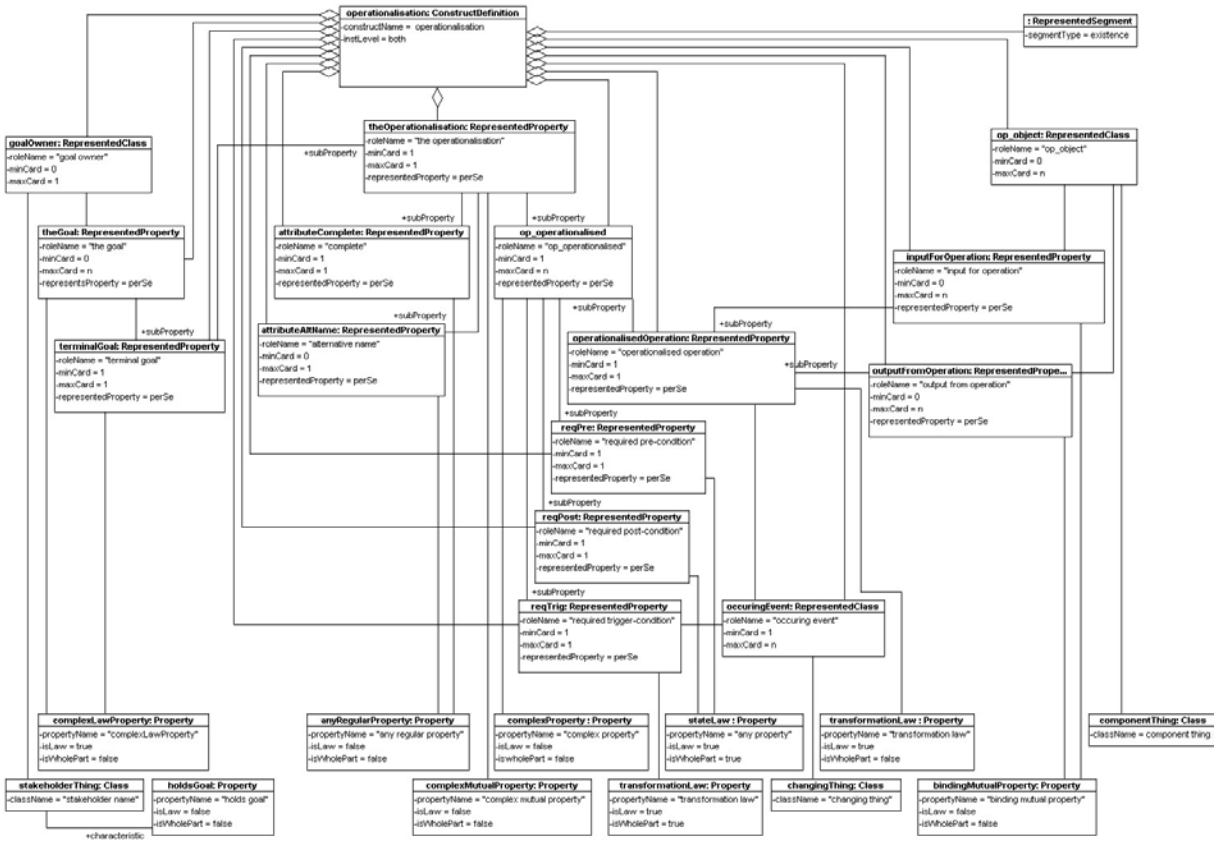
Behaviour

Existence

Modality (permission, recommendation etc)

Regular assertion

4. Open Issues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-instLevel = both
: RepresentedSegment
-segmentType = existence
theOperationalisation: RepresentedProperty
-roleName = "the operationalisation"
-minCard = 1
-maxCard = 1
-representedProperty = perSe
+subProperty
goalOwner: RepresentedClass
-roleName = "goal owner"
-minCard = 0
-maxCard = 1
op_object: RepresentedClass
-roleName = "op_object"
-minCard = 0
-maxCard = n
theGoal: RepresentedProperty
-roleName = "the goal"
-minCard = 0
-maxCard = n
-representsProperty = perSe
attributeComplete: RepresentedProperty
-roleName = "complete"
-minCard = 1
-maxCard = 1
-representedProperty = perSe
op_operationalised
-roleName = "op_operationalised"
-minCard = 1
-maxCard = n
-representedProperty = perSe
inputForOperation: RepresentedProperty
-roleName = "input for operation"
-minCard = 0
-maxCard = n
-representedProperty = perSe
terminalGoal: RepresentedProperty
-roleName = "terminal goal"
-minCard = 1
-maxCard = 1
-representedProperty = perSe
attributeAltName: RepresentedProperty
-roleName = "alternative name"
-minCard = 0
-maxCard = 1
-representedProperty = perSe
operationalisedOperation: RepresentedProperty
-roleName = "operationalised operation"
-minCard = 1
-maxCard = 1
-representedProperty = perSe
outputFromOperation: RepresentedPrope...
-roleName = "output from operation"
-minCard = 0
-maxCard = n
-representedProperty = perSe
reqPre: RepresentedProperty
-roleName = "required pre-condition"
-minCard = 1
-maxCard = 1
-representedProperty = perSe
reqPost: RepresentedProperty
-roleName = "required post-condition"
-minCard = 1
-maxCard = 1
-representedProperty = perSe
reqTrig: RepresentedProperty
-roleName = "required trigger-condition"
-minCard = 1
-maxCard = 1
-representedProperty = perSe
occuringEvent: RepresentedClass
-roleName = "occuring event"
-minCard = 1
-maxCard = n
complexLawProperty: Property
-propertyName = "complexLawProperty"
-isLaw = true
-isWholePart = false
anyRegularProperty: Property
-propertyName = "any regular property"
-isLaw = false
-isWholePart = false
complexProperty : Property
-propertyName = "complex property"
-isLaw = false
-isWholePart = false
stateLaw : Property
-propertyName = "any property"
-isLaw = true
-isWholePart = true
transformationLaw : Property
-propertyName = "transformation law"
-isLaw = true
-isWholePart = false
componentThing: Class
-className = component thing
stakeholderThing: Class
-className = "stakeholder name"
holdsGoal: Property
-propertyName = "holds goal"
-isLaw = false
-isWholePart = false
+characteristic
complexMutualProperty: Property
-propertyName = "complex mutual property"
-isLaw = false
-isWholePart = false
transformationLaw: Property
-propertyName = "transformation law"
-isLaw = true
-isWholePart = true
changingThing: Class
-className = "changing thing"
bindingMutualProperty: Property
-propertyName = "binding mutual property"
-isLaw = false
-isWholePart = false

KAOS : Output

Document type:	Working document
Domain/Task/Topic:	DEM / UEML / Approaches
Version:	
Date:	2005.11.30
Status:	2nd iteration
Authors:	Raimundas Matulevičius
Distribution list:	DEM
Document history:	

An object is among the *outputs* of an operation if it is among the sorts making up the co-domain of the relation defined by the operation.

1. Preamble

Builds on

Built on by

Construct name

Outputs

Alternative construct names

Related, but distinct construct names

Related terms

Inputs **:** An *object* is among the *inputs* of an *operation* if it is among the sorts making up the domain of the relation defined by the *operation*.

Language

KAOS,
http://www2.info.ucl.ac.be/research/projects/AVL/ReqEng.html

Diagram type

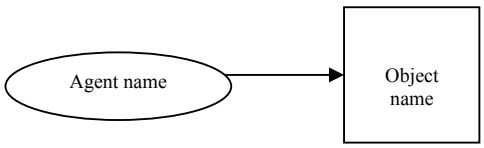
Operation model

2. Presentation

Builds on

Built on by

Icon, line style, text



Outputs

User-definable attributes

[0:1] ***WhichAtt*** : String = “”. Indicate which attributes of the object are specifically monitored.

Relations to other constructs

- Belongs to 1..1 operation model.
- 0:n [1:1], Object. *Object* has output from an *operation.*
- 0:n [1:1], Operation. *Operation* outputs *object* attributes (changes its value).

Diagram layout conventions

Other usage conventions

3. Representation

Builds on

Built on by

Instantiation level

Type level

Classes of things

1:1 “*outObject*” **played by** *ComponentThing*.
Represents *object,* which is output from operation.

0:n, “*causingEvent*” **played by** *ChangingThing*.

Properties (and relationships)

1:1, “*theOutput*” **played by** *BindingMutualProperty*.
Belongs to: 0:n [1:1] *object*.
Describing *output*. Output is a binding mutual property between the object which receives output from operation and the event which causes this operation.

1:n, “*explicitObjAttribute*” **played by** *AnyProperty*.
Belongs to: *outObject*.
Sub-property of: *theOutput*.
Defines explicitly which attribute of the object is an output.

1:n, “*implicitObjAttribute*” **played by** *AnyProperty*.
Belongs to: *outObject*.
Sub-property of: *theOutput*.
Does not define explicitly which attribute of the object is an output.

0:1, “*attributeWhichAtt*” **played by** *AnyRegularProperty*.
Sub-property: *theOutput*.
Representing the *output* attribute *whichAtt*.

0:n [1:1], “*fromOperation*” **played by** *TransformationLaw*.
Belongs to: *causingEvent*.
Sub-property: *theOutput*.
Transformation law: operation produces output.
Describing the operation which has output.
Also represented by: *operation*.

Behaviour

Existence

Modality (permission, recommendation etc)

Regular assertion

4. Open Issues

KAOS : Performance

Document type:	Working document
Domain/Task/Topic:	DEM / UEML / Approaches
Version:	
Date:	2005.11.30
Status:	2nd iteration
Authors:	Raimundas Matulevičius
Distribution list:	DEM
Document history:	

An operation is related to the agent that can initiate it through a *performance* link. Performance is an OR meta-relationship linking *agents* to *operations*.

1. Preamble

Builds on

Built on by

Construct name

Performance

Alternative construct names

Performs

Related, but distinct construct names

Related terms

Language

KAOS,
http://www2.info.ucl.ac.be/research/projects/AVL/ReqEng.html

Diagram type

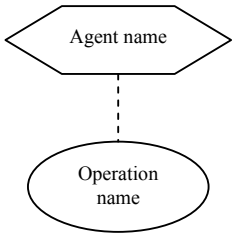
Agent model

2. Presentation

Builds on

Built on by

Icon, line style, text



Performance

User-definable attributes

[0:1] *Agent* : Agent. Declare the agent.
[0:1] *AltName* : String = "". Name of alternative OR-assignments.

Relations to other constructs

- Belongs to 1..1 agent model.
- 1:1 [1:1], Agent. *Agent* performs *operation*.
- 1:n [1:1], Operation. *Operation* is performed by agent.

Diagram layout conventions

Other usage conventions

3. Representation

Builds on

Agent

Built on by

Instantiation level

Type level

Classes of things

1:1, "*goalOwner*" **played by** *StakeholderThing*.
Describing *goal owner* which holds the goal. Class *StakeholderThing* has a characteristic *holds goal*. *StakeholderThing* is subclass of the BWW-*HumanThing*.

1:1 "*responsibleAgent*" **played by** *ActiveComponentThing*.
Represents the responsible agent.

Properties (and relationships)

1:1, "*theGoal*" **played by** *ComplexLawProperty*.
Belongs to: 0:1 [1:1], *goalOwner*.
Law: restricts the the possible values of the *object* attributes.
Representing the goal which is held by a goal owner.

1:1, "*terminalGoal*" **played by** *StateLaw*.
Belongs to: 0:1 [1:1], *goalOwner*.
Sub-property: 1:1 [1:1], *theGoal.*
State law: $\forall g \in$ Goal, $\forall a \in$ Assignment, a.assignedGoal = g
$\Rightarrow \neg\exists$ gr $\in$ G-refinement: gr.superGoal = g
Only terminal goals can by assigned.

1:1, "*thePerformance*" **played by** *ComplexMutualProperty*.
Type: OR-relationship.

Belongs to: 1:n [1:1] *responsibleAgent*.
Representing the performance. Performance is a complex mutual property of the responsible agent and the goal owner. Agent performs the operation in order to satisfy the goal.

0:1, "*attributeAgent*" **played by** *AnyRegularProperty*.
Sub-property: *thePerformance*.
Representing the *performance* attribute *agent*.

0:1, "*attributeAltName*" **played by** *AnyRegularProperty*.
Sub-property: *thePerformancce*.
Represents *performance* attribute *altName*.

1:1 [1:1], "*performedOperation*" **played by** *TransformationLaw*.
Sub-property: *thePerformance*.
Transformation law: agent performs operation to satisfy the goal.
Describing the operation which is performed by agent.
Also represented by: *operation*.

1:n [1:1], "*operationalisation*" **played by** *ComplexMutualProperty*.
Sub-property: *performedOperation*.
Sub-property: *terminalGoal*.
Describing the operationalisation relationship.
Also represented by: *operationalisation*.

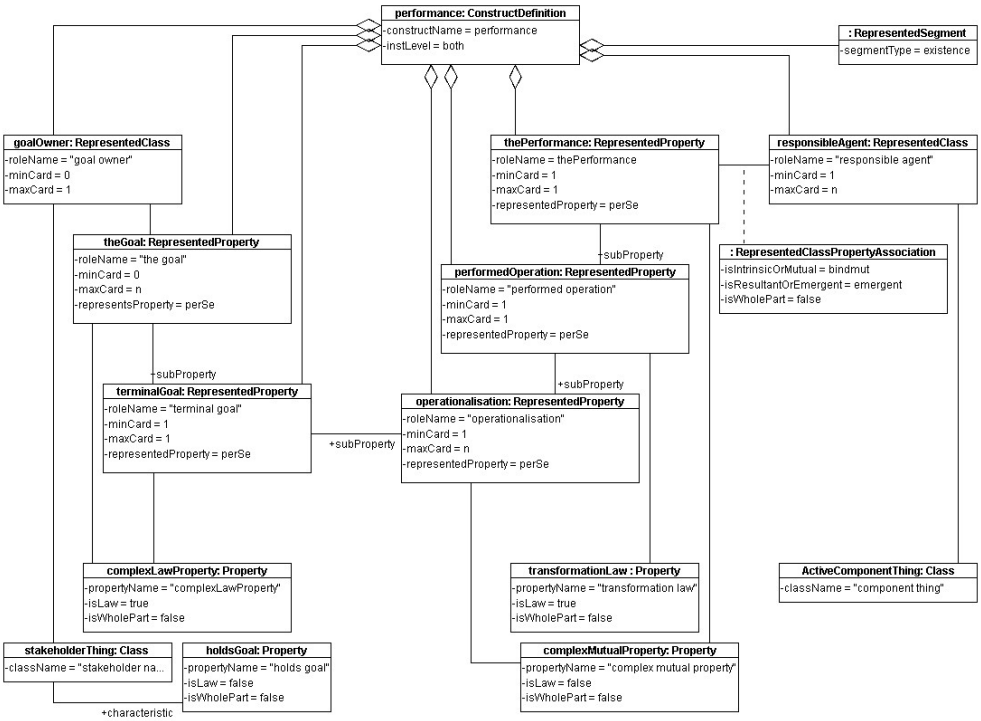
Behaviour

Existence

Modality (permission, recommendation etc)

Regular assertion

4. Open Issues



KAOS : Requirement

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Domain/Task/Topic:	DEM / UEML / Approaches
Version:	
Date:	2005.11.30
Status:	2nd iteration
Authors:	Raimundas Matulevičius
Distribution list:	DEM
Document history:	

A *requirement* is a goal assigned to an agent in the software-to-be.

1. Preamble

Builds on

Goal

Built on by

Construct name

Requirement

Alternative construct names

Related, but distinct construct names

Terminal goal: goal which has no G-requirement.

Related terms

Expectation (*assumption*): a goal assigned to an agent in the environment.
Softgoal: a goal that cannot be said to be satisfied in a clearcut sense.
Comment: can a requirement be a softgoal?
Maintain goal: a goal requiring that some property always holds.
Avoid goal: a goal requiring that some property never holds.
Achieve goal: a goal requiring that some property eventually hold.
Cease goal: a goal requiring that some property eventually stops to hold.

Language

KAOS,
http://www2.info.ucl.ac.be/research/projects/AVL/ReqEng.html

Diagram type

Goal model

2. Presentation

Builds on

Built on by

Icon, line style, text

Requirement

User-definable attributes

Requirement inherits all the attributes of the goal.

Relations to other constructs

- Belongs 1:1 to goal model.
- 1:n [1:n], *responsible* : *software agent*. *Requirement* is assigned through responsibility relationship to a *software agent*.

Diagram layout conventions

Other usage conventions

3. Representation

Builds on

Comment: *Requirement* is a goal and has most of the goal classes and properties. But *requirement* is also a terminal goal, so it has no G-refinement.

Built on by

Instantiation level

Instance level

Classes of things

1:1, "*softwareAgent*" **played by** *ActiveComponentThing*.
Describing the agent a *requirement* is assigned.

Properties (and relationships)

1:1, "*theRequirement*" **played by** *ComplexStateLaw*.
Belongs to: 0:1 [0:n] *softwareAgent*.
Belongs to: 0:1 [1:1] *goalOwner*.
State law: Is restricted by the assignement relationship. A requirement himself restricts state of the concerned object.
Representing the *requirement*. Requirement as a goal, has a goal owner.

1:1, "*isTerminalGoal*" **played by** *StateLaw*.
Sub-property: 1:1 [1:1], *theRequirement.*
State law: $\forall g \in$ Goal, $\forall a \in$ Assignment, a.assignedGoal = g

$\Rightarrow \neg\exists$ gr $\in$ G-refinement: gr.superGoal = g

Requirement is a terminal *goal* which means that an *requirement* can not have G-refinement.

Behaviour

Existence

Modality (permission, recommendation etc)

Intention of a goal owner;
Obligation of a *software agent*.

4. Open Issues

KAOS : Softgoal

Document type:	Working document
Domain/Task/Topic:	DEM / UEML / Approaches
Version:	
Date:	2005.11.30
Status:	2nd iteration
Authors:	Raimundas Matulevičius
Distribution list:	DEM
Document history:	

A *softgoal* is a goal that cannot be said to be satisfied in a clearcut sense. It prescribes classes of preferred behaviour.

1. Preamble

Builds on

Goal

Built on by

Construct name

Softgoal

Alternative construct names

Goal
Preferred behaviour

Related, but distinct construct names

Related terms

Requirement : a goal assigned to an agent in the software to be.
Assumption : a goal assigned to an agent in the environment.

Language

KAOS,
http://www2.info.ucl.ac.be/research/projects/AVL/ReqEng.html

Diagram type

Goal model

2. Presentation

Builds on

Built on by

Icon, line style, text

Softgoal

User-definable attributes

[0:1] *Type* : set_of [*Minimize*, *Maximize, Reduce, Increase, Improve*]. Describes type of the softgoal.

Relations to other constructs

Diagram layout conventions

Other usage conventions

3. Semantics

Builds on

Comment: Softgoals can be And/Or refined like any other KAOS goals, conflicts between softgoals goals can also be captured. An important research issue concerns the precise definition of optimization goals, reasoning techniques about softgoals, and the role of such goals in selecting among alternative goal refinements.

Built on by

Instantiation level

Instance level

Classes of things

Properties (and relationships)

1:1, "*theSoftGoal*" **played by** *ComplexLawProperty*.
Representing the *softgoal*.

1:1, "*notSatisfiedClearly*" **played by** *AnyProperty*.
The *softgoal* has property (rather feature) not to be satisfied in a clearcut sense.

0:1 [1:1], "*attributeType*" **played by** *AnyRegularProperty*.
Sub-property: *theSoftGoal*.
Represents *goal* attribute *type*.

Behaviour

Existence

Modality (permission, recommendation etc)

Intention of a goal owner;

4. Open Issues

Comment: Further investigation about all softgoal (as goal) features is needed!

KAOS : Software agent

Document type:	Working document
Domain/Task/Topic:	DEM / UEML / Approaches
Version:	
Date:	2005.11.30
Status:	2nd iteration
Authors:	Raimundas Matulevičius
Distribution list:	DEM
Document history:	

Software agent is an agent in the system-to-be.

1. Preamble

Builds on

Agent

Built on by

Construct name

Software agent

Alternative construct names

Agent in the system-to-be

Related, but distinct construct names

Related terms

- ***Agents*** : active objects capable of performing operations.
- ***Environment agent*** : e.g., pre-existing software component, sensor, actuator, human, organisational unit, etc.

Language

KAOS,
http://www2.info.ucl.ac.be/research/projects/AVL/ReqEng.html

Diagram type

Agent model

2. Presentation

Builds on

Built on by

Icon, line style, text

Software agent

User-definable attributes

Relations to other constructs

Diagram layout conventions

Other usage conventions

3. Representation

Builds on

Built on by

Instantiation level

Type level

Classes of things

1:1, "*theSoftwareAgent*" **played by** *ComponentSoftwareThing*.
Representing the *software agent*. *Software agents* are *agents* and inherits all agent attributes and properties.

Properties (and relationships)

Behaviour

Existence

Modality (permission, recommendation etc)

Regular assertion

4. Open Issues